The Electrical Industry's Weekly Magazine

October 17, 1960

Electrical World

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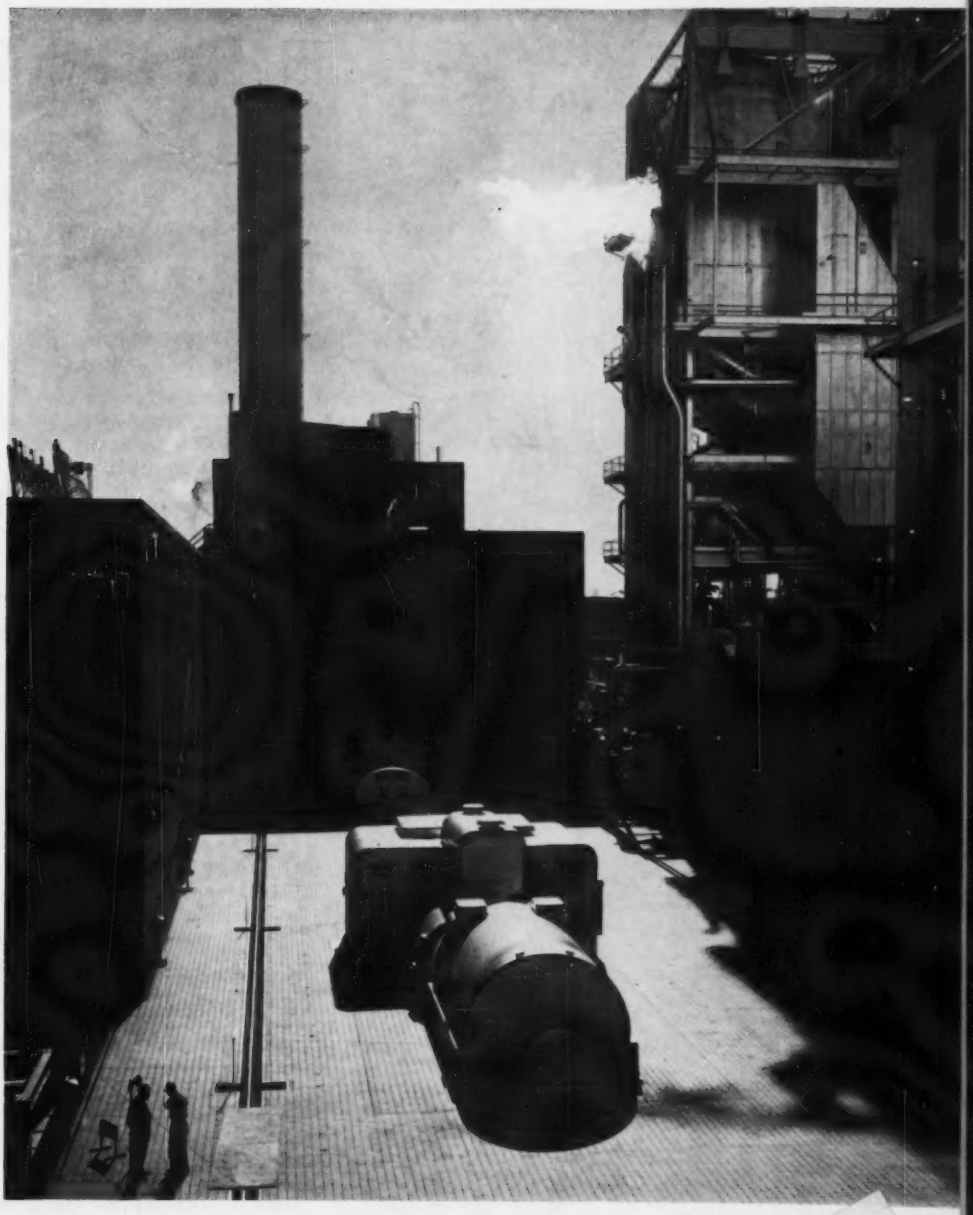

40.5-Mw Topping Unit Boosts Capacity, Improves Heat Rate...

THIS ISSUE PREVIEWED ON PAGE 11

UNIV MICROFILMS INC
EDITORIAL DEPT
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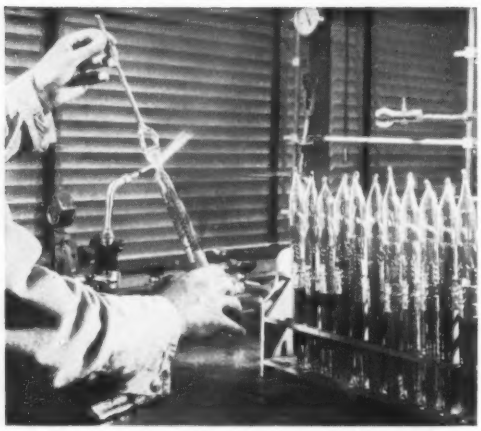
ANN ARBOR MICH

General Electric's Permalex* Insulation Takes the Steam Out of an Old Problem in Transformer Design



ACCELERATED AGING of scaled-down hermetically sealed insulation systems (above) in ovens (below) gives scientists in G.E.'s Insulation Lab important data on thermal resistance and compatibility of materials.

GENERAL ELECTRIC'S PERMALEX INSULATION SYSTEM is one of the most significant developments in the last 25 years. Quite literally, it takes the steam out of the old problem of thermal degradation of insulation systems in distribution, network, and medium transformers.

WATER, formed under higher operating temperatures, causes deterioration of all insulation components. The weakest link, therefore, until the development of Permalex insulation, was kraft paper, whose cellulose structure includes water-forming hydroxyl groups.

TO MARKEDLY REDUCE WATER FORMATION, scientists in General Electric's Insulation Materials Laboratory, after evaluating many alternatives, hit upon cyanoethylation of paper pulp as the best solution. In this process, cyanoethyl groups replace the most weakly held hydroxyl groups on the cellulose molecule, altering its chemical structure. Hydroxyl groups which are not replaced have their chemical bonds strengthened.

BENEFITS of this important development are either greater transformer loadability or longer transformer life. This is true because:

- Thermal resistance of kraft paper insulation is increased at least 20% in the range of 150 to 175C.
- The dielectric life of even the best enameled wire, such as Formex* wire, is also increased.
- The life of the transformer oil is increased.
- Cyanoethylation is a *chemical* reaction with the kraft pulp; it is not an additive or scavenging process with materials that can be dissolved out to contaminate the oil or induce corrosion of metal.
- Cyanoethylated kraft paper is completely compatible with all other materials used in General Electric transformers.

A 20 PERCENT THERMAL uprating of distribution transformers originally announced by General Electric scientists in 1959 now appears to be quite conservative after a year's experience with Permalex insulation. The direct and quantitative relation of thermal improvements to higher transformer loadability is of great fundamental importance to the industry and may well foreshadow a revision of industry standards. Meanwhile, you may profitably utilize the higher kva 55°/65° ratings appearing on all General Electric oil-filled distribution, medium, and network transformers.

SAVINGS that you can realize with General Electric distribution, network, and medium transformers can be spelled out for you by your General Electric Sales Engineer. Call him today. General Electric Company, Schenectady 5, N. Y. 604-07

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GENERAL ELECTRIC

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

OCTOBER 17, 1960
Vol. 154, No. 16

Electrical What in the World . . .

In our Aug. 15 issue, we lauded Theodore Levitt's "Marketing Myopia" article, in the July-August 1960 *Harvard Business Review*.

Levitt, sounding off against a "nation of product-oriented business managers," said American business today is not "customer oriented." Roughly, he defined "product orientation" as that attitude which concentrates on turning a product into cash; "customer orientation" as that which emphasizes determination of and obedience to the needs and desires of the customer. His prescription for business survival: become *customer oriented;* don't *sell, market.* We believe this advice is particularly pertinent today.

Thus, believing in Levitt's prescription, we'd be sorry editors indeed if we didn't take his medicine ourselves. As far as we're concerned, there is *always* a "buyer's market" in our business.

Our customers are you, the readers. We know *who* you are; our subscription classification breakdowns tell us that—how many are top executives, how many chief engineers, plant superintendents, sales executives, and so on.

And we have tools for testing your needs and desires. Our readership research studies, based on actual field interviews, give us an insight here. You may have encountered some of these interviewers. Not only can you rely on our appreciation for your cooperation, but you can rest assured it is a vital assist in guiding us to best serve your needs.

But we also rely heavily on your letters, especially when we're making format changes such as you've seen in the issues since Sept. 26. So grab a pen and give us the benefit of hearing from "the boss." We depend on it.

Chuck Hochgesang

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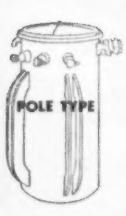
Built in accordance with established standards or to specified requirements, Niagara Transformers cover practically every service through 10,000 kva, 69,000 volts. Write for Bulletin 139. Niagara Transformer Corp., P.O. Box 23, Buffalo 25, N. Y. Representatives in principal cities.

"There they are . . . we'll have power as scheduled."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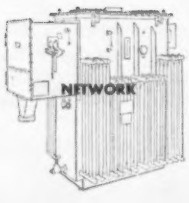
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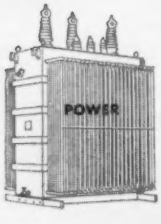
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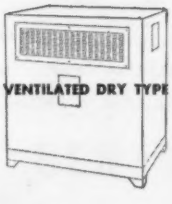
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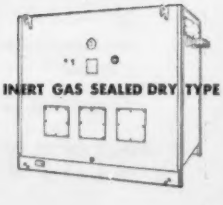
UNIT SUBSTATION


INERT GAS SEALED DRY TYPE

Letters

The Older Meters Are Accurate Too

To the Editor:

I have read the editorial in the Sept. 26 issue, "After the Ball—New Opportunities," with great interest but with some misgivings.

I am happy that *Electrical World* recognizes the importance of the watthour meter and its further development with a front page editorial, but I have fears about the inference that meters made since 1940 are not doing a good job and will not continue to do so.

The sustained service accuracy of the ball and jewel meters of all manufacturers, as proven by more than 20 years of service, is excellent. The revenues of the utilities have not suffered and the charges made to customers have not been inequitable, nor will they be so if the utilities continue to use the ball and jewel meters in the future. The results of thousands of tests on ball and jewel meters reported by the utility industry have proven this to be true.

The meter manufacturer welcomes more rapid equipment retirement and the purchase of new meters, but we cannot condone the inference that meters made for the electric industry in the past have not always been excellent measuring instruments and will remain so with minimum maintenance.

James H. Patton, vice president
Sangamo Electric Co

▶Far be it from us to cast aspersions on a meter which has been the faithful symbol of accuracy in the utility industry for half a century.

Oklahoma G&E Peak Up 7.1%

To the Editor:

In *Electrical World* (Sept. 26, p 64) there was an article on summer peak loads listing companies. I hope you will examine the statement for Oklahoma & Electric Co which shows –56.1 Mw (for comparison with previous year) and –7.1% (for percentage difference). Both these should be plus.

Donald S. Kennedy, president
Oklahoma Gas & Electric Co

▶Thank you, Reader Kennedy, for bringing this to the attention of other readers. We print your letter as a means of correcting the error.

Dateline . . .

Mexico City—On September 27, the Mexican government officially took control of the big Mexican Light & Power Co utility (Mexlight). There were parades and apparent "joy" in the streets.

But, in the rank and file labor groups there was some "apprehension." When the Canadian company (Belgian controlled) was in private hands, it was paying its workers some 20 to 30% more in base salaries than the government was paying its own workers in the Comision Federal de Electricidad (Federal Electric Commission) utility. Mexlight workers are also getting more pay than their brothers in the previously nationalized American & Foreign Power Co Mexican utilities (called "Impulsora").

The government named a new management to take care of this pressing labor problem and other problems facing Mexlight, which markets 40% of all electricity in Mexico. Named as chairman of the board was a top government official, Antonio Ortiz Mena, the minister of Hacienda (Treasury). Eduardo Garduño, sub-secretary of Hacienda in charge of taxes, was named president. Garduño, operating chief of the company, was once manager of the Banco Cinematografico (mixed private-government capital bank to finance movies) and has long been a close friend of Mexico's President Adolfo Lopez Mateos.

This management team, backed up by many other top government officials—mostly from the Hacienda and other related organizations—has "labor" at the head of the list of "things to do." The government has very carefully kept the three major electricity producing companies separated. The FEC continues with its old management as an "autonomous" government company. The "Impulsora" is under the management of the Nacional Financiera (government development bank) and now the Mexlight

(*Continued on page* 54)

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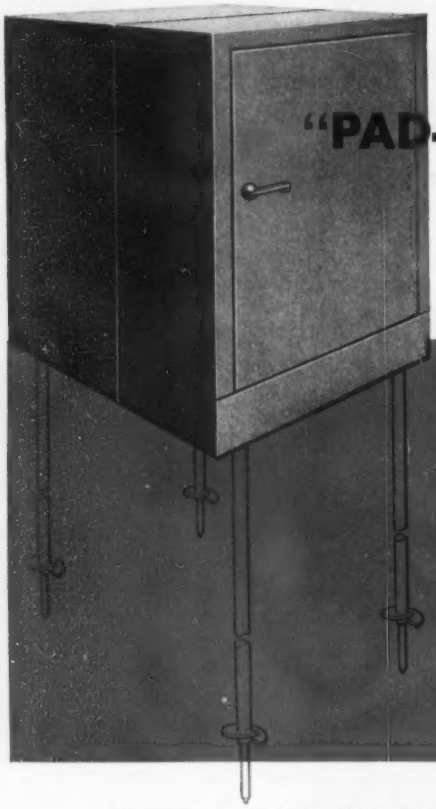


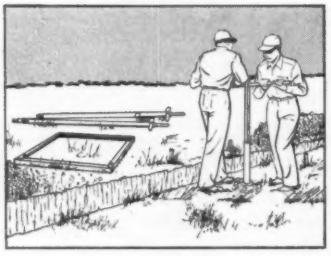
Complete MOUNTING of "PAD-MOUNTED" TRANSFORMERS in LESS than an HOUR

NO concrete pads to pour or handle...
NO delays for grading

CHANCE FOUNDATION ANCHORS

Now you can install pad-mounted transformers *without concrete pads.* Chance Foundation Anchors make this possible . . . let you cut installation time by eliminating the need for special excavations, rock foundations and pouring concrete or handling pre-formed pads. You get a "foundation" that is impervious to seasonal changes because the anchors screw down below the frost level. Transformers can't move . . . they aren't affected by freezing, thawing, or moisture penetration. Mounting can be completed in less than an hour without waiting for the trench to be filled and graded.

Write for a detailed bulletin that shows how Chance Anchors can help you save time in the installation of pad-mounted transformers.



Two men—using a square shank wrench—can install Chance Foundation Anchors in 8 to 10 minutes per anchor. Installation is permanent, and the anchor helix supports, as well as holds down, the transformer.

When anchors are installed, they are checked for level, and attached to a transformer bracket. The transformer is then bolted to the bracket, and the job is ready for energizing, trench-filling, final grading and landscaping.

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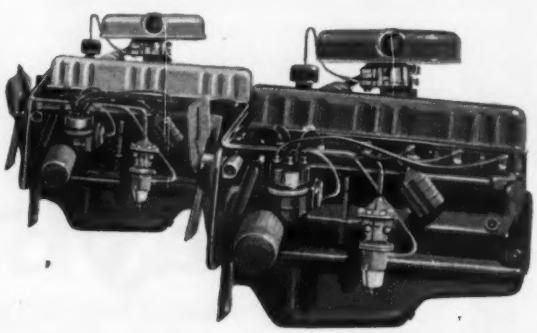
What a Falcon saves you on price* could keep your gas tank filled for thousands of miles! And there's more savings to come! Main underbody members are Zinclad-protected against rust and corrosion. Front fenders bolt on for ease of replacement—cost just $29.95 each. Insurance is as much as 15% less. Aluminized muffler lasts up to three times as long as ordinary types. You save on tires, on brakes, on oil . . . you name it and your Falcon saves it!

*Based on latest available manufacturers' suggested retail delivered prices

ECONOMY NEVER HAD SUCH STYLE



LOW GAS COSTS—OVER 30 MILES PER GALLON IN CERTIFIED TESTS!

In certified tests by the country's foremost independent automotive experts, the Falcon Pickup with 144-cu. in. Six scored as high as 38.3 miles per gallon! Average of all tests combined—hills and traffic, as well as moderate speeds on the level—was 30.5 mpg! Low oil costs, too—change it only every 4000 miles!

- *Roomy comfort for 3 husky passengers!*
- *Rides, handles like a passenger car!*
- *High Falcon fashion inside as well as out!*
- *Optional Fordomatic Drive available!*

1961 Falcon Ranchero, shown here in Montecarlo Red, is available in 8 handsome colors with Color-Keyed Luxury interiors.

NEW HIGH-PERFORMANCE OPTIONAL SIX!

For '61 Ford's new Falcon Ranchero offers a choice of two modern gas-saving engines—144 Economy Six and, as an option, a new high-performance 170 Six. Both available with standard or Fordomatic transmissions. And thanks to the simplicity of their proven design, servicing is fast, low in cost!

See your Ford Dealer's Certified Economy Book . . . it proves

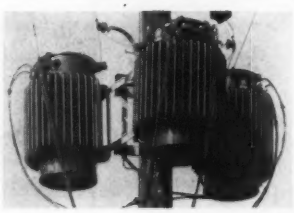
FORD TRUCKS COST LESS

LOW LOADING HEIGHT

Cargo floor to the ground measures a scant 25.2 inches . . . that means easy loading. And what a load! The Falcon Ranchero has a full 800-lb. load capacity! In its big six-foot box—over 7½ feet with tailgate flat—there's room to spare for just about any pickup job! You can open or close the tailgate with one hand . . . it locks tight and rattle-free automatically!

More power for your installation dollar with Featherweight Pole Star® Distribution Transformers

Total capacity: 1000 kva! Just a few years ago, such a concentration of power in a single overhead installation would have been impracticable. Today, it is easily accomplished with Featherweight Pole Star Distribution Transformers—using poles and platform materials that are the equivalent of those required for roughly *half* as much capacity in the early fifties. In addition to platform installations, some utilities now place as much as 500 to 750 kva on a single pole, by cluster-mounting three transformers.



The trend toward more kva per pound and per cubic foot has gained considerable impetus in recent years, since the "breakthrough" made in 1953 with introduction of the 167-kva Featherweight Pole Star—the first distribution transformer above 100 kva to be designed for pole mounting. It was followed with a 250-kva unit. This year, Pennsylvania's Pole Star Featherweight design was extended to 333 kva. Besides encouraging high-capacity platform installations such as that shown, the new 333-kva Featherweight Pole Star is suitable for mounting on either a 45-foot Class 3 or 35-foot Class 4 southern pine or douglas fir pole. Thus, Pennsylvania has *tripled* the practical limit for single-transformer pole mounting in just seven years.

Bulletin D-560 gives weights, dimensions, electrical data, and design and construction details of the complete line of Featherweight Pole Star Distribution Transformers. For a copy—or a quotation on specific requirements—contact Distribution Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pennsylvania.

McGRAW-EDISON

PENNSYLVANIA POLE STAR DISTRIBUTION TRANSFORMERS

Electrical World

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LATE NEWS ▶ **Five Pacific Northwest power companies** study purchase of power from proposed Peace River project in Canada. B.C. Electric, Puget Sound P&L, Washington Water Power, Portland GE, and Pacific P&L are prospective purchasers; Idaho Power and Montana Power are sitting in on committee sessions.

Ohio PUC whacks a second 30% hunk from Cincinnati G&E rate request after listening to Dr Robert Eisner, a Northwestern University professor. He convinced PUC that accelerated depreciation savings be passed along to consumer.

US Supreme Court denies review of territorial limitation case brought by Union Rural Electric Assn, Inc, after Colorado PUC rules Union could expand its area only if power was not available from another utility. . . . Court also refused to hear complaint by Memphis AFL-CIO Labor Council that city raised rates unreasonably.

Killed in tragic airplane crash in Boston Harbor were: D. F. Kurtz, 61, manager, rates and standard practices, Philadelphia Electric; J. A. Zobel, 58, manager, rates and market research, Southern Services, and E. P. Hafers, 53, rates manager, South Carolina G&E. They had been attending an EEI committee meeting. Glen Coan, Duke Power rate engineer, missed crash only because he was afraid Charlotte, N. C., airport would be closed by an air lines pilot strike.

Iowa P&L wins court case to annex 210-Mw generating station to Des Moines. City of Pleasant Hill contested the action in attempt to keep plant on tax rolls. Annexation may cancel Des Moines' tax on gross receipts recently accepted by utility.

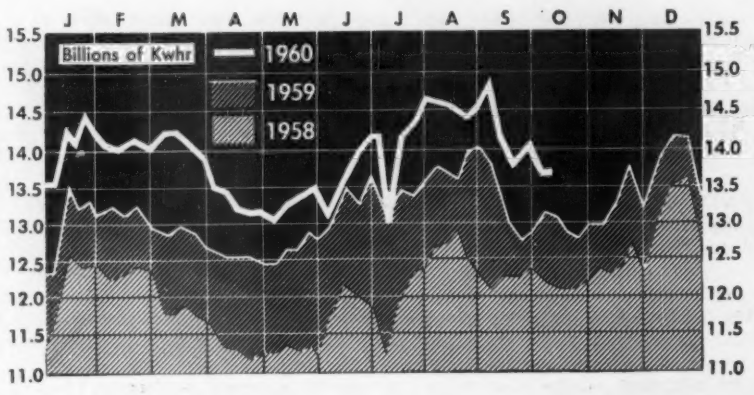
West Penn Electric System asks stockholders to approve name change to Allegheny Power System, Inc. Vote is Nov. 9.

Canadian Supreme Court rules that B.C. Electric is entitled to rate increase refused by PUC in 1958. BCE will not raise rates. Tried the case to clarify.

Washington State Supreme Court rules that utilities are partially responsible for safety of aircraft when lines are adjacent to airports. Prime responsibility is with airport operators, but passes to utility if operators fail to act.

Proposed condemnation of Puget Sound P&L properties in Thurston County, Wash., will be election issue. Voters will pick PUD commission chairman. Incumbent Frank Meyer favors condemnation; candidate V. G. Francis is opposed.

WEEKLY POWER OUTPUT—Up 4.9% (Week ending Oct. 8), Kwhr 13,725,000,000



Per Cent Change From Previous Year

	Sept. 24	Oct. 1	Oct. 8
Total U. S.	+ 9.9	+ 4.1	+ 4.9
New Eng.	+ 3.3	+ 1.5	+ 2.4
Mid. Atlan.	+ 4.0	+ 0.1	− 1.3
Cent. Indust.	+ 6.5	+ 6.2	+ 5.2
West Cent.	+ 9.6	+ 8.2	+ 7.8
Southeast	+ 7.6	+ 1.7	+ 2.8
South Cent.	+13.1	− 5.4	+ 7.7
Rocky Mount.	+15.1	+15.1	+17.2
Pacific			
NW	+ 8.6	+ 7.2	+ 5.0
SW	+15.5	+15.0	+11.9

Seasonally Adjusted Index 265.7

Week Ago 267.3 Year Ago 256.5

Source: Edison Electric Institute

Supply Lines

SPOT COAL MARKET NEAR FIVE-YEAR LOW

Coal prices were riding low last week as they have for the past month or two. The sagging prices applied to spot purchases—those for limited quantities of lower-grade coal. The market had little effect on the utilities which buy most of their requirements under full-year contracts, but the spot buyers were having a field day. One utility buyer who follows the market closely said the spot prices were near a five-year low. A representative for a large coal supplier which sells to a number of Northeastern utilities characterized the utility coal market as "soupy," by which he meant soft prices and oversupplies.

Moderate summer weather was a big factor in the coal price picture. Buyers and sellers agreed that the relatively light air conditioning loads of the summer had held back kwhr production—thus trimming coal consumption. Utilities in many areas were drawing much less than they had anticipated just a few months earlier. Smaller mines were trying to work off their built-up inventories with the lower prices. Suppliers said the oil import quotas had had little effect on the utility markets because utilities were slow to change their fuel-buying habits or because of the problems of converting from oil to coal burning equipment. Nor did they blame a drop in coal exports for the oversupply. Coal shipped abroad, they said, is of different quality than that used by utilities.

Utility coal buyers who buy under contract showed little envy for the spot buyers. "The time will come when the shoe will be on the other foot," said one buyer who negotiates full-year contracts. "The buyer may be having his day now, but the supplier will also have a day." Some large utilities work under three and five-year contracts, and some Tennessee Valley Authority coal contracts run for much longer. Utility coal buyers who favor longer term contracts argue that such arrangements help both the supplier and the railroads to plan far enough ahead to bring about solid, long-range economies.

GE SAYS 'STILL IN BUSINESS' DESPITE STRIKE

General Electrical Co says that despite the strike, it is still in business and is actively quoting in the utility market. While this is the official statement of the company, a quick check of some of the product groups affected shows only some minor variations. In Pittsfield, Mass., the large power transformer department says it is continuing to quote on the basis of normal shipments. There are also "ample stocks" of lightning arresters including station and intermediate types. Voltage regulator stocks are allright through the end of the year. In distribution transformers, production of standard pole-type units is unimpaired. For larger sized units and network transformers, the department says it is continuing to quote on a normal delivery basis. The low-voltage switchgear department indicates relays and network supplies are adequate. Other product departments within the company could not be reached in time for comment.

Meanwhile, the strike of the International Union of Electrical Workers (IUE) has settled down in expectation of a long road ahead. Although the union and the company are still holding negotiating sessions with federal mediators, the main battlefield has been moved from the bargaining table to the press media. The union is hoping it can stir up public opinion to the point where the company will be forced to accept third-party government intervention, a move which GE opposes vigorously. The company is hoping to sway public opinion in the opposite direc-

tion, while at the same time trying to convince striking workers that this is an unnecessary strike. It is of course too early to tell which way the battle will go. At Westinghouse, there has been no indication that the IUE will strike.

EQUIPMENT PRICES LEVELING; MORE INVENTORY TRIMMING SEEN

Electrical equipment items escaped radical price changes in September according to the monthly survey of business report released by the National Association of Purchasing Agents. This was the first time in five months that one or more of these items had not appeared on the "down side" of NAPA price changes. The monthly report is a composite opinion of all purchasing agents comprising the NAPA business survey committee.

"Quality has taken on new importance," say the purchasing men. "Many companies are reported attempting to bolster their sales by giving increased emphasis to the production of a trouble-free, superior product."

Still more inventory trimming is a possibility, the NAPA report indicated. In response to a survey question, the purchasing men from all industries answered in the following manner: 38% said their inventories were still higher than they would like to see them. Only 4% planned to add to their stocks. But the majority, 58%, said they had now reached the ideal level. In comparing September inventories with the previous month 13% of the purchasing men said they had higher inventories; 37% reported lower inventories; and 50% reported they had the same level as in August.

TVA AWARDS INSULATOR CONTRACT TO JAPAN

Tennessee Valley Authority turned to the foreign insulator market this month after giving domestic firms a second crack at a 28,500 lot of 10-in. suspension insulators. The contract went to Mitsubishi International Corp (Japanese) on an evaluated bid of $82,471.20 (which included a 12% addition on the base bid and cost of inspection). Lowest domestic bid was $91,200. Five identical bids of $92,625 were submitted by other domestic firms.

This is TVA's first purchase of Japanese insulators as far as Mitsubishi knows. Mitsubishi is the east coast sales agency for Nippon Gaishi Kaisha (NGK). However, NGK has been selling to Bonneville Power Administration through a west coast importer at the rate of about $250,000 per year, according to BPA.

Accurate insulator import figures are impossible to get from the government because of broad classification areas. Moreover, the west coast importer is reported to have brought in insulators at less than the 30% tariff for electrical porcelain by registering the insulators in other categories at tariffs as low as 17%.

On the export side, statistics appear to be more reliable. The Commerce Department reports that insulator exports dropped from their 1958 high of $2.9 million to $1.6 million in 1959. So far 1960 figures indicate that this lower rate is still prevailing. Most of the decrease in exports is due to lower orders from Sweden, Brazil, Cuba, and Mexico. Recently Ralph Jenner, president of Lapp, stated the industry's case to the government against a proposed downward revision of existing tariff rates. Outcome of the tariff hearing is uncertain.

L-M ANNOUNCES

New Electronic Control For Reclosers

The New L-M Electronic Control gives Relay, System Protection, and Substation Engineers what they have always wanted—speed, accuracy, accessibility, flexibility.

Oil Circuit Reclosers as developed by Line Material are universally accepted as tremendously efficient, cost-saving protection for distribution lines and substations.

One reason for L-M's outstanding leadership in reclosers has been the L-M-developed hydraulic control, an extremely dependable self-contained unit that permitted engineers to solve protection problems simply.

Today, Line Material announces another revolutionary new engineering development—the Electronic Control.

The L-M Electronic Control consists of solid-state transistorized sensing and control devices; time-delay relays for resetting and reclosing; provisions for ground current tripping; test and control switches; and plug-in electronic components to provide for changing time-current curves and sequences without service interruptions. The L-M control provides greater flexibility, greater accessibility, and a wider choice of time-current curves than have been available even with L-M's outstanding hydraulic control.

This new control is available with both
L-M Type RE and Type WE Reclosers.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

483 **Reclosers, Sectionalizers, and Oil Switches**

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

New Electro

For Rec

The New L-M Electronic Contr
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wanted—speed, accuracy, acces

Oil Circuit Reclosers as developed by
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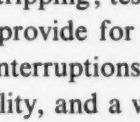

This new control is
L-M Type RE and

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**ntrol gives Relay, System Pro-
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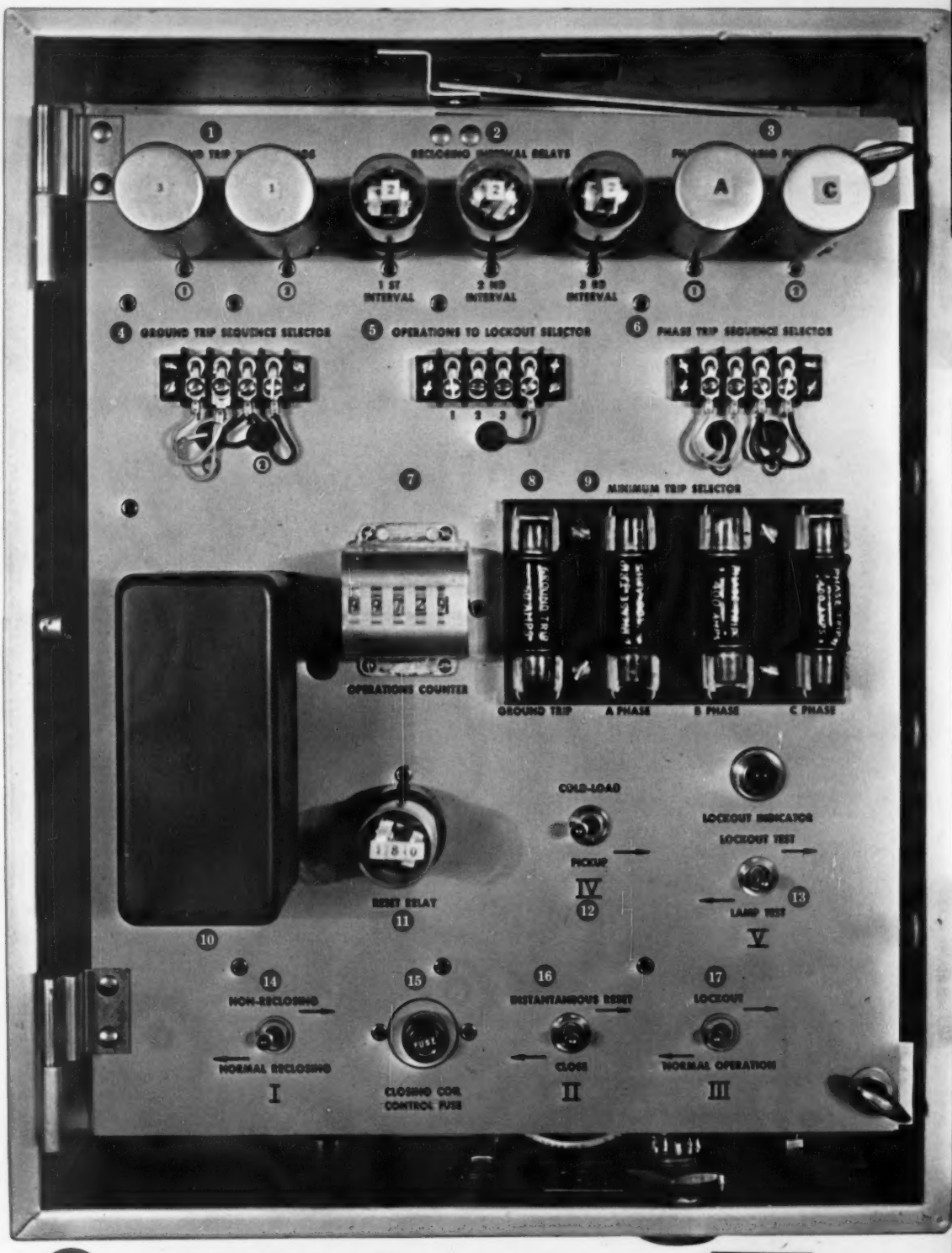
L-M ANNOUNCES



LINE MATERIAL® Industries
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483 *Reclosers, Sectionalizers, and Oil Switches*

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

How The L-M Electronic Control Works

L-M's revolutionary new Electronic Control provides accurate and dependable opening and closing of reclosers as dictated by your coordination scheme. L-M Reclosers with Electronic Control offer the simplest, most flexible and most stable means of protecting and assuring the continuity of service. All problems, whether protection or coordination, can be solved, and at a lower cost than comparable protective devices.

This new control is contained in a cabinet separate from the recloser. Remote control and remote indication are easily added. The panel features unitized construction for test or replacement. Component changes can be made right on the panel without service interruption.

Self-contained current transformers supply the control with an indication of phase current. Depending upon the current and the time-current characteristics selected, the control computes opening time and directs recloser to open. After the selected reclosing interval has elapsed, the recloser will close. Sequence relay operates to the second selected time-current characteristic and reclosing interval.

If fault or high-current persists, control will continue to operate in a similar manner until the recloser locks open.

Optional ground-current tripping is similar to phase-current tripping.

Power for the control system is supplied by a 24-volt sealed nickel-cadmium battery. No external power supply is required to operate this electronic control. A Zener diode trickle charging circuit with separate bushing current transformer keeps battery at peak power. Power for closing recloser is supplied by the distribution lines.

REFER TO NUMBERS ON PANEL AT LEFT.

1 GROUND-TRIP TIMING PLUGS—sealed circuit of solid-state components provide a choice of two time-current characteristics for ground current tripping. Any two time-current characteristics may be selected from curves 1, 2, and 3. Characteristics may be field changed by simply plugging-in a different choice. (OPTIONAL)

2 RECLOSING INTERVAL RELAYS provide choice of 8 time intervals from ¼ second to 60 seconds between successive reclosings. Relays may be field changed simply by plugging-in a different choice.

3 PHASE TRIP TIMING PLUGS—sealed circuit of solid-state components, provide a choice of two time-current characteristics for phase current tripping. Any two time-current characteristics may be selected from X, A, B, C, D or E curves. Characteristics may be field changed by simply plugging-in a different choice.

4 GROUND TRIP SEQUENCE SELECTOR—connections at this terminal board determine the sequence of time-current characteristics for ground-current tripping. Any sequence may be obtained. Field changes are simply made by reconnection of terminal board. (OPTIONAL)

5 OPERATIONS TO LOCKOUT SELECTOR—connection to terminal 1 through 4 determines the number of operations before reclosers remain open. Selection may be field changed by reconnecting to desired terminals.

6 PHASE TRIP SEQUENCE SELECTOR—connections at this terminal board determine the sequence of time-current characteristics for phase-current tripping. Any sequence of the two selected time-current characteristics may be obtained. Field changes are made simply by reconnection of this terminal board.

7 OPERATIONS COUNTER—electrically operated counter indexes one digit each time the recloser opens.

8 MINIMUM GROUND-TRIP SELECTOR—resistance cartridge determines the minimum ground-trip current. Cartridge is marked in amperes. Field changes may be made simply by replacing with cartridge for desired trip current without tripping recloser. (OPTIONAL)

9 MINIMUM-TRIP SELECTOR—resistance cartridges determine the minimum-trip current for each phase. Cartridges are marked in amperes. Trip current may be different for each phase. Field changes may be made by simply replacing with cartridge for desired trip current. Recloser need not be tripped open when field changes are made.

10 SEQUENCE RELAY—sealed relay provides sequencing for the control circuit.

11 RESET RELAY—sealed thermal time-delay relay resets control circuit if fault clears before entire sequence of recloser operates to lock out. A new sequence of operations will be performed when another fault occurs. Choice of intervals from 9 relays with range of 10 to 180 seconds—interval must be greater than time of complete recloser sequence. Field changes are made by plugging-in desired relay.

12 COLD-LOAD PICKUP—momentary switch to prevent recloser from opening during current surges when service is restored after extended outages.

13 LOCKOUT INDICATOR—signal lamp for visual indication when recloser locks open. Momentary switch tests the lamp in one direction, and indicates lockout of recloser in the other direction.

14 NON-RECLOSING-NORMAL RECLOSING—permits elimination of control sequence. With switch in non-reclosing position, recloser will operate once and lock out.

15 CLOSING COIL CONTROL FUSE—when line voltage is too low to reclose, fuse blows to prevent operation of closing solenoid coil contactor.

16 INSTANTANEOUS RESET-CLOSE—switch by-passes the normal reset time delay relay in one direction and closes recloser in the other direction.

17 LOCKOUT-NORMAL OPERATION—switch will permit locking recloser open from the control panel. Recloser will not close unless this switch is returned to the "NORMAL OPERATION" position.

The Greatest Advance in Reclosers

Since L-M Developed the Hydraulic Control

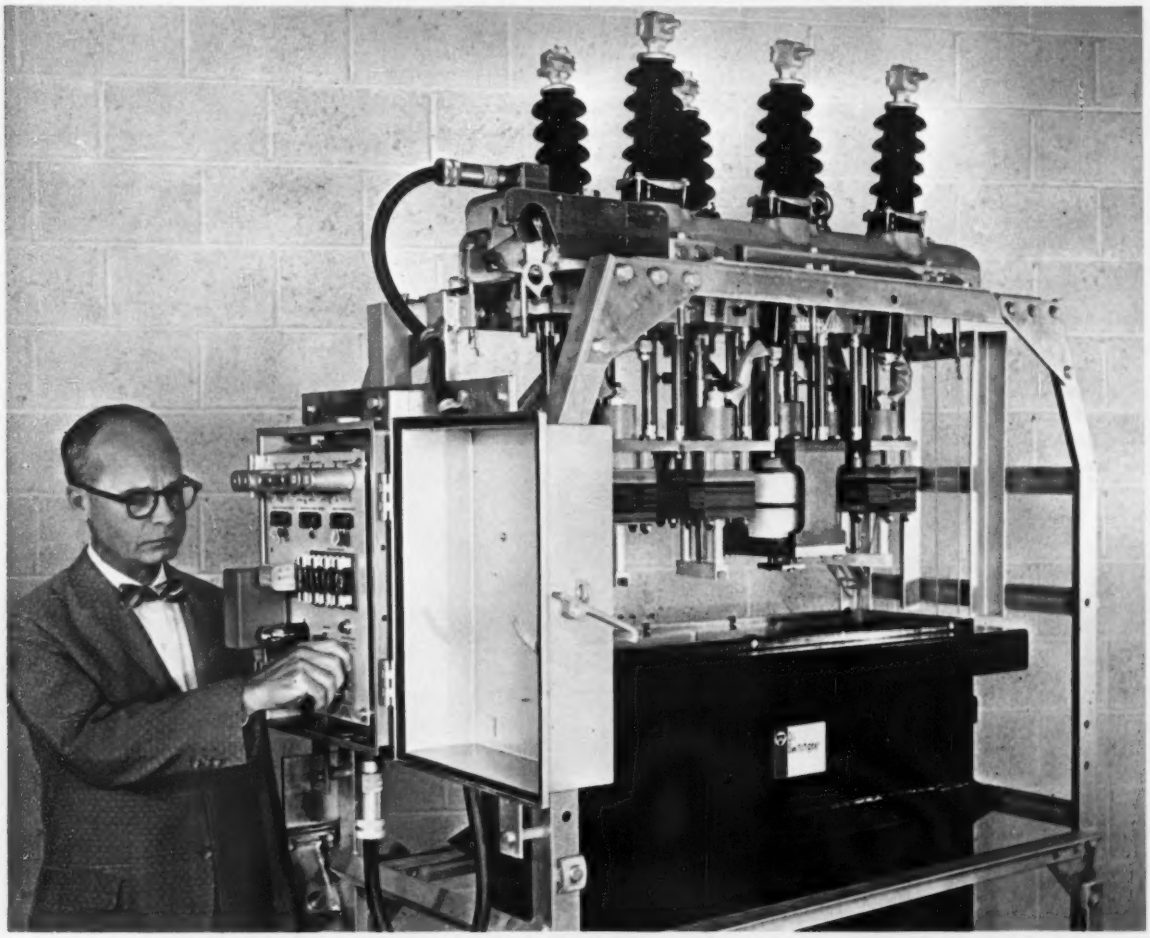
L-M's New Control has been thoroughly tested. It provides the engineer with a wide choice of time-current curves and operating sequences. Equipment and components are easily accessible for testing, for changes in timing and sequencing to meet the most accurate coordination requirements.

A wide choice of control possibilities are already built-in: remote operation, cold-load pickup, with optional ground current tripping available.

Never before, in any type of apparatus, has the engineer found such great convenience, such dependable accuracy, such flexibility, and such economy, as are provided by the revolutionary new Line Material Type RE and Type WE electronically controlled reclosers.

Now Get Electronic Coordination

Get complete details on this outstanding improvement by Line Material in automatic line protection. Ask the L-M Field Engineer for Product Information Bulletin CR1WE, and ideas on how you can take advantage of this remarkable new development in oil circuit reclosers. Call the nearest L-M office; or phone or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.



N. K. Delaney, Product Manager, Switchgear and Capacitors, checks out the lockout indicator and signal lamp on the Electronic Control. Note that the control is connected to the recloser with a flexible cable and plug-in receptacles, so that the control can be mounted at any location.

AVAILABLE FOR BOTH TYPE RE AND TYPE WE RECLOSERS

Type RE: 400 amperes continuous with 7 trip current ratings from 100 through 800 amperes in voltages from 2.4 through 14.4 kv. Interrupting capacity to 6000 amperes at 4.8 kv, 5000 amperes at 8.32 kv and 4000 amperes at 14.4 kv.

TYPE WE: 560 amperes continuous with 6 trip current ratings from 200 through 1120 amperes in voltages from 2.4 through 14.4 kv. Interrupting capacities to 12,000 amperes at 4.8 kv, 10,000 amperes at 8.32 kv and 8000 amperes at 14.4 kv.

LINE MATERIAL® Industries

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Reclosers, Sectionalizers, and Oil Switches

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
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HIGH-PRESSURE JETS BLAST DEPOSIT-PACKED BUNDLES CLEAN AS NEW

Automatic jet unit removes bundle deposits, without dismantling.

The high-pressure jet unit below is blasting solidly-caked deposits from a heat exchange bundle . . . removing substantially all traces of deposits throughout the bundle, without cutting it apart!

Nation-wide Dow Industrial Service developed this automatic unit to remove scale, coke and asphalt deposits without metal erosion or wall thinning. This is just one of many advanced tools and techniques developed by Dow Industrial Service to clean equipment of every kind... boilers, pipelines, chemical process equipment, towers, scrubbers.

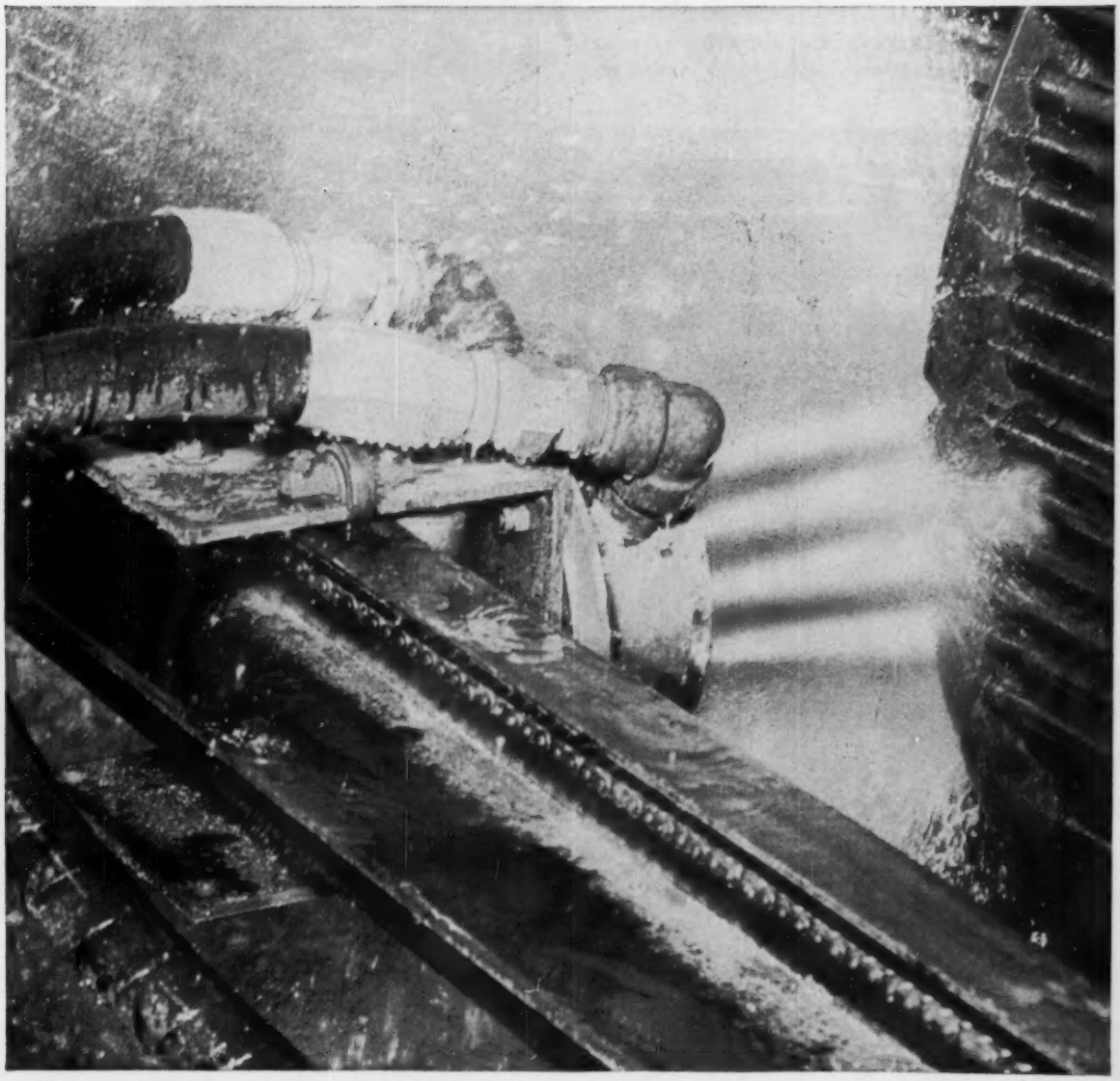
D. I. S. engineers first analyze your problem, then pick the most effective cleaning method . . . whether chemicals, steam, jet, foam, or other means. D. I. S. tailors the technique to give you most value per dollar.

In addition, D. I. S. offers complete consulting laboratory service for water treatment and waste processing problems, backed by the technical resources of The Dow Chemical Company.

D. I. S. is a nation-wide industrial service . . . and offers "total" cleaning. For cleaning equipment of *any* kind, *anywhere*, call D. I. S. We'll be glad to show you how to set up a year 'round cleaning program to *keep* equipment operating at top efficiency. Write or call DOW INDUSTRIAL SERVICE, 20575 Center Ridge Road, Cleveland 16, Ohio.

DOW

DOW INDUSTRIAL SERVICE • Division of The Dow Chemical Company



Get more usable Kva for your

with WAGNER®

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

distribution transformer dollar

HI-THERMAL-CAP *TRANSFORMERS*

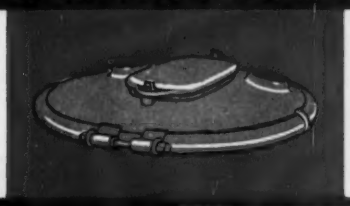
Every dollar you invest in Wagner® HI-THERMAL-CAP Transformers really buys a dollar and twelve cents worth of usable Kva. For you can safely uprate these High Capability Transformers to 112% of their nameplate Kva without shortening normal life expectancy . . . without exceeding the allowable 65°C hot spot temperature rise.

HI-THERMAL-CAP Transformers have new, compact coils wound LV–HV–LV on one insulating cylinder. Corrugated oil ducts and thermosetting barrier insulation lock the sections into a unit of great mechanical strength. Coils have been subjected to short circuit tests using 50 times normal current (two times as great as the industry standard) without failure.

The HI-THERMAL-CAP element, which combines this improved coil with a wound core of cold-rolled oriented grain steel, has excellent electrical characteristics: low impedance for better voltage regulation; low core and copper loss for economical operation. You get full efficiency plus high capability with new Wagner HI-THERMAL-CAP Transformers.

HI-THERMAL-CAP Transformers, built in single-phase ratings 167 Kva and smaller, 15 KV and below (for direct pole mounting), are now available from factory, branch, and distributor stocks. Your Wagner Sales Engineer has complete information. Consult him, or write us.

MORE FOR YOUR MONEY IN MECHANICAL FEATURES:

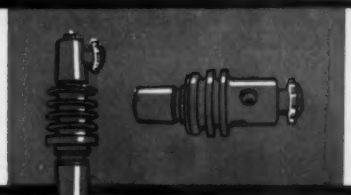


PLASTIC-COATED COVER

A porcelain-like coating gives improved corrosion resistance to tank covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Applied to the covers, clamping ring and cover bolts, it is available without extra cost on all transformers with cover mounted bushings.

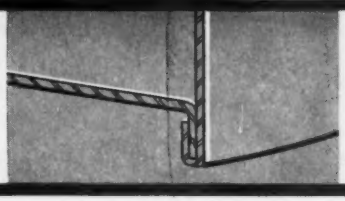
LONG LASTING TANK FINISH

A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.



SAFETY KEYED BUSHINGS

Heavy wet-process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

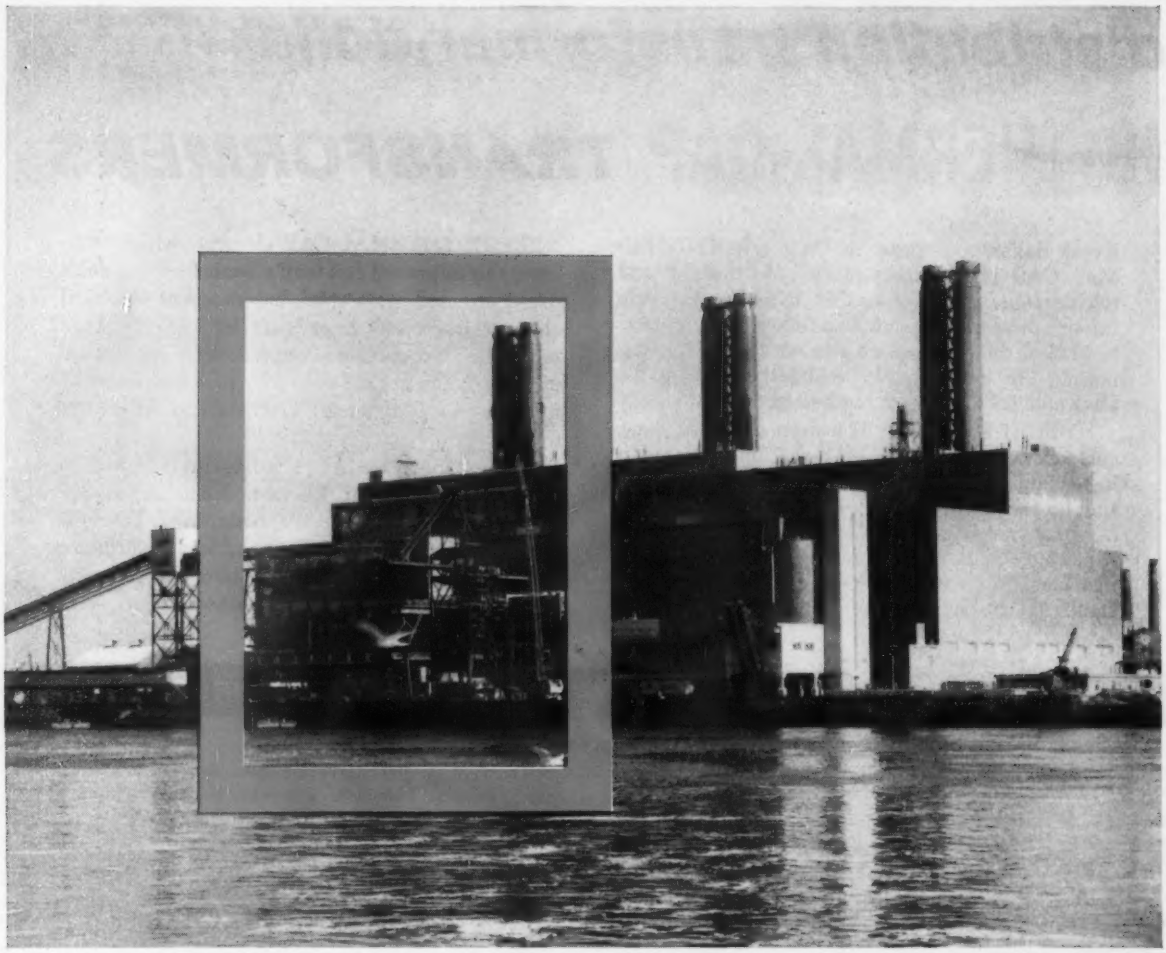
This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessens the chance for finish damage due to scraping.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT60-20



At Consolidated Edison's Astoria Station Unit No. 4 . . .

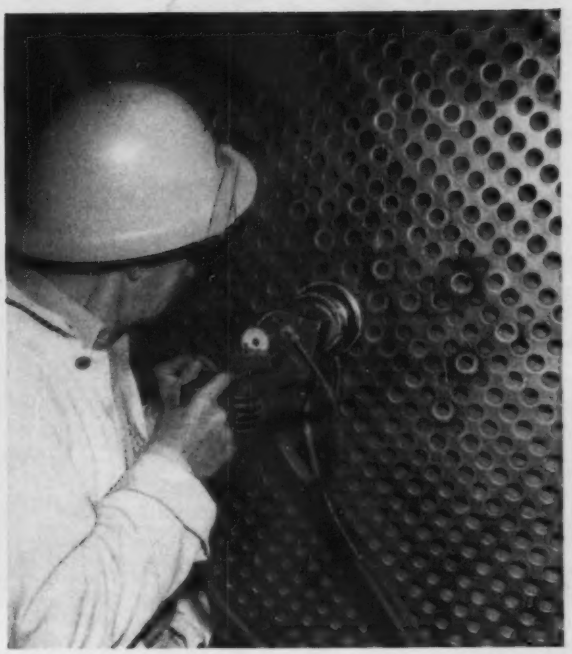
NEW PHELPS DODGE TECHNIQUE
WELDS-IN ALUMINUM BRASS CONDENSER TUBES!

The first welded main condenser using aluminum-brass condenser tubes has recently been completed at Consolidated Edison's Astoria Station. This condenser will help to add a 357,000 KW block of generating capacity to the line in 1960. Half of these tubes were manufactured by Phelps Dodge under rigid specification. All of the tubes were welded in by the M. H. Treadwell Company under Phelps Dodge supervision. In tests to date, the welded condenser tube joints have surpassed performance predicted for them.

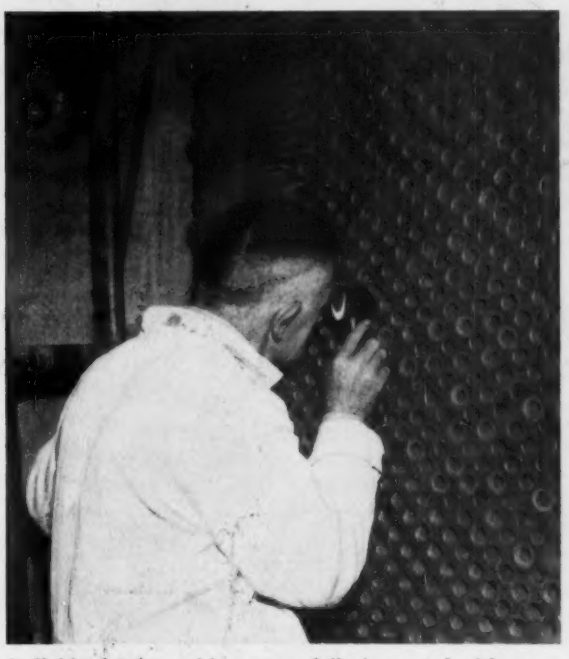
Specially designed Phelps Dodge welding guns which automatically weld tubes to tube sheets were used by Treadwell. The entire operating cycle for these guns is controlled by preset relays and timers. These relays and timers start, stop and regulate electrode motion, welding current and argon flow.

This new technique, pioneered in Phelps Dodge laboratories, answers an industry need for more positive, permanent protection from tube joint leakage. It is another in the long list of significant contributions Phelps Dodge has made in the heat exchanger and condenser tube field during more than 40 years of outstanding service.

In first step, tubes are installed in the main condenser and flared prior to welding operation. Careful attention is paid to keeping tube joints clean at all times.



Tubes are welded securely to tube sheet with special type gun. Average operator makes a completely tight weld in less than thirty seconds for each tube.



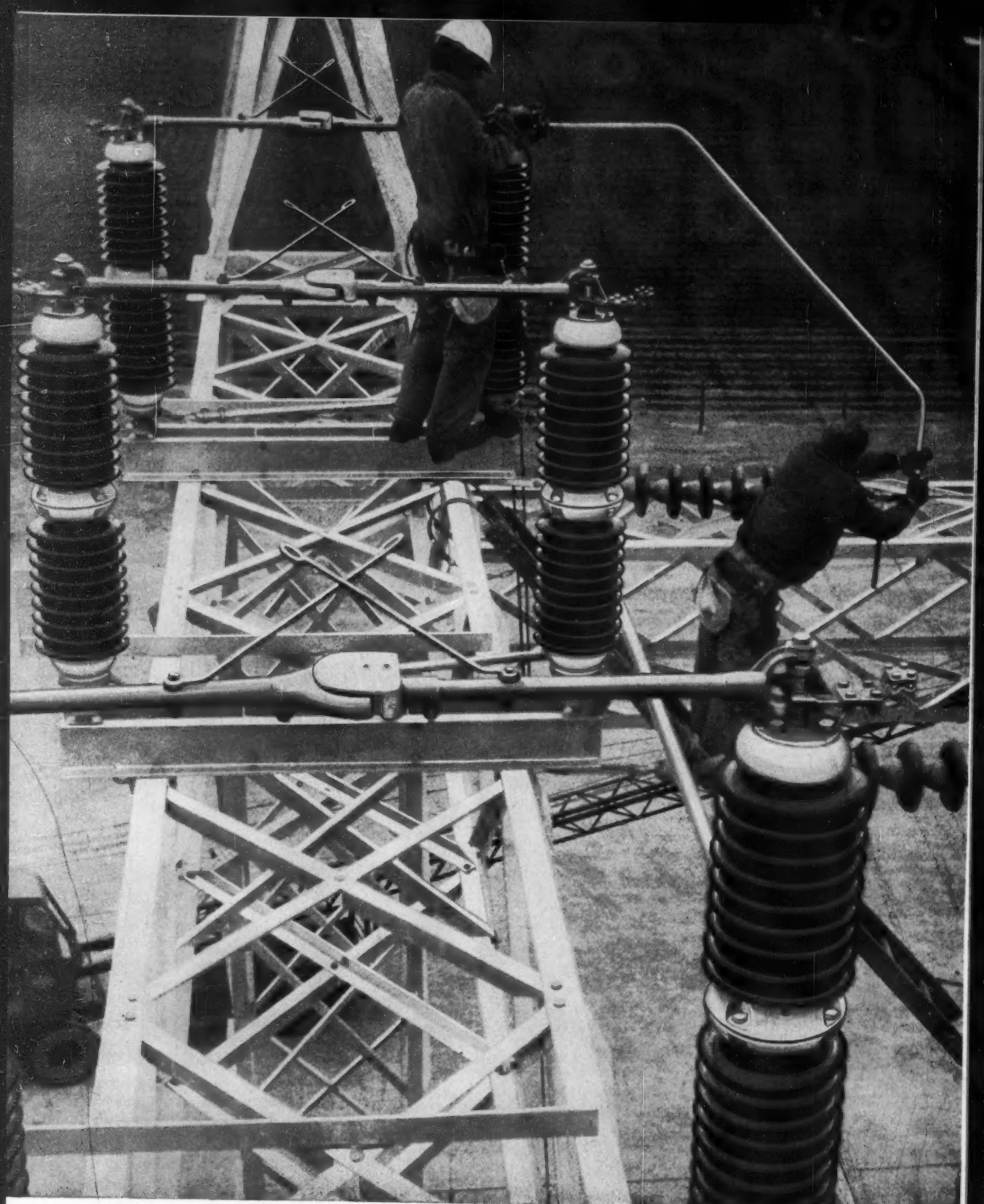
Individual tube welds are carefully inspected with magnifying glass. Incomplete or unsound welds are corrected by re-welding.

Additional inspection test consists of painting soap bubble solution on tube sheet. When main condenser is placed under 5 psi air pressure, leaks are readily detected.

PHELPS DODGE COPPER PRODUCTS

CORPORATION

300 Park Avenue, New York 22, N. Y.



Southern States 115 kv, 600 ampere Type GG switches being installed. The GG is available in voltage ratings from 34.5 kv – 161 kv and continuous current ratings of 600 and 1200 amperes.

KEEP PACE WITH ELECTRICITY

CURRENT FOLLOWS LOW RESISTANCE PATH THROUGH SOUTHERN STATES' BRAIDLESS AIR SWITCHES

Southern States has solved the big problem of providing efficient current transfer in high pressure, braidless side-break air switches. A unique design overcomes any question of reliability in the two current-carrying swivel assemblies inherent in this type of switch.

As a result, in the new Southern States Type 57L and Type GG you can now be assured of low resistance through each swivel assembly, adequate capacity for short circuit currents, and freedom from corrosion and contamination.

This is accomplished by the four-piece swivel units* consisting of carefully machined terminal and blade castings, hinge pin, and pressure clamp —securely bolted together so that the pressure clamp and terminal casting fit into deep, matching grooves on the hinge pin. The silver-plated grooves provide a natural barrier to foreign matter, act as a stable bearing surface for the terminal, and furnish a liberal contact area. The assembly is permanently sealed with a non-aging lubricant.

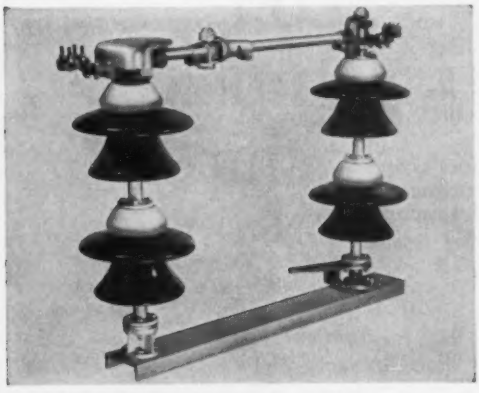
The hinge pin and terminal casting are kept under high pressure by a stainless steel coil spring (insulated by a nylon spacer) to establish the most efficient current interchange point.

The entire assembly, although under high pressure, rotates smoothly—without binding or wedging. It operates satisfactorily under short circuit conditions and well within the limits defined by NEMA for continuous current performance.

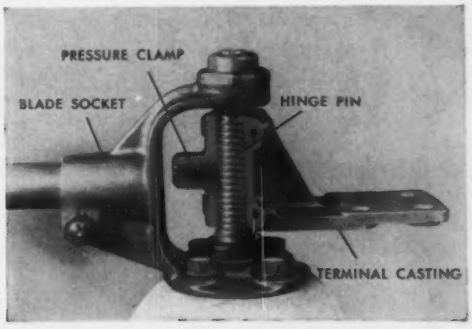
AMPLITACT® contacts are added assurance of contact performance under extremely high fault currents.

For complete details on these new braidless switches, contact your Southern States representative or write directly to us.

*Toggle point of 57L switch blade uses modified version of this assembly.



Type 57L braidless side break available in voltage ratings from 7.2 kv - 161 kv and continuous ratings of 600 and 1200 amperes.



SWIVEL ASSEMBLY—CUTAWAY VIEW

The GG uses the swivel assembly shown as the pivot on both rotating insulators. The 57L uses an identical assembly on its rotating insulator and the same construction principle at the toggle point of the 57L blade.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

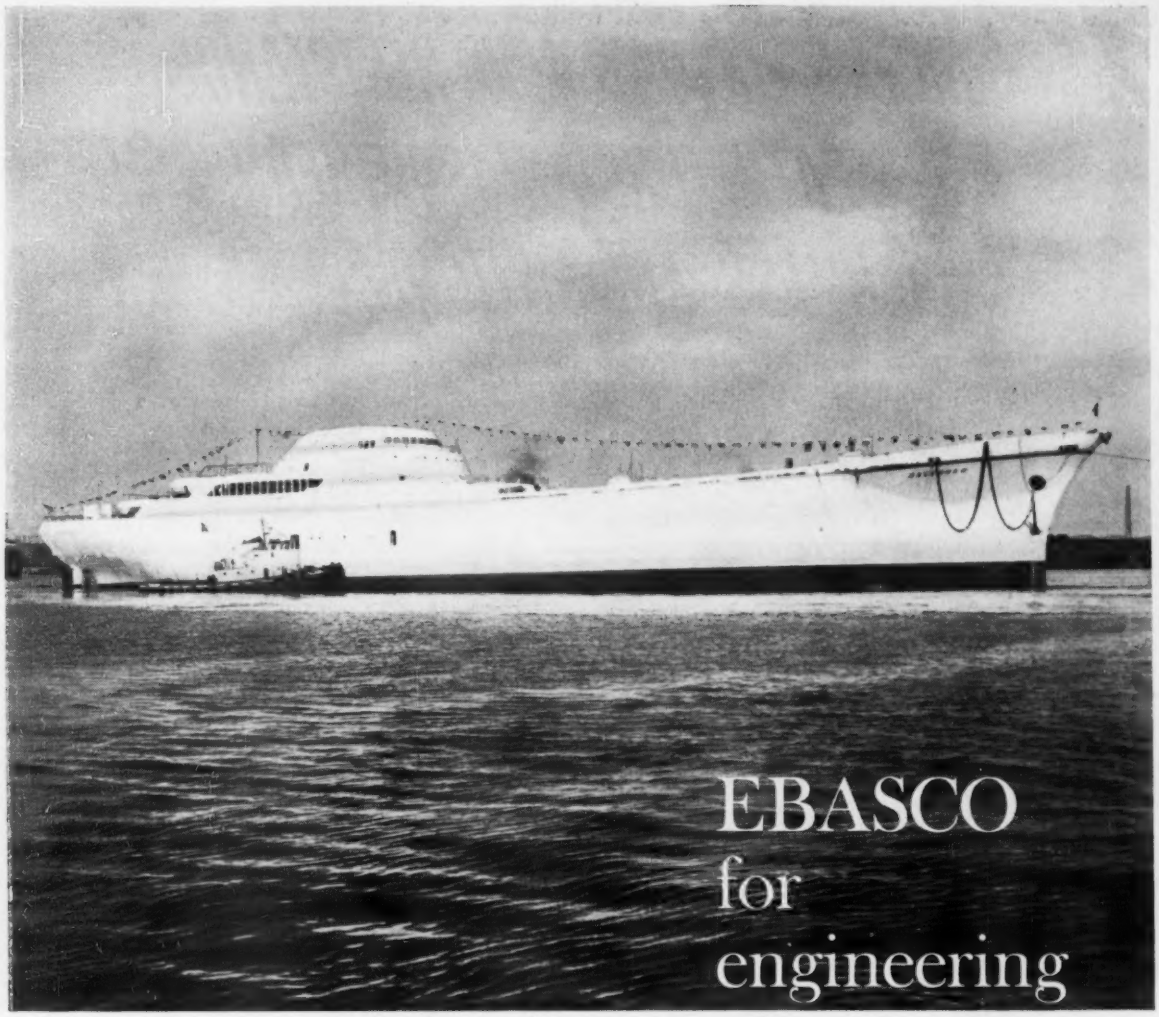


Photo of N.S. Savannah courtesy of The Babcock & Wilcox Company

EBASCO, under a prime contract with the Atomic Energy Commission, is performing an engineering review from the viewpoint of reliability and economy of the design of the nuclear power plant and related service equipment and systems of the world's first nuclear powered merchant ship—the N.S. Savannah.

In addition, under a contract with States Marine Lines as operators of the N.S. Savannah, EBASCO is providing engineering services related to the inspection of spare parts for the N.S. Savannah.

EBASCO performs the following nuclear engineering services for clients:

* Reactor Systems Evaluations
* Design of Nuclear Plants
* Construction of Nuclear Plants
* Hazards Analyses
* Start-Up and Testing of Plants
* Training of Operating Staff
* Engineering and Economic Investigations
* Research and Development Assistance
* Nuclear Investment Consultation
* Coordination with Government Agencies

For more information about Ebasco's nuclear engineering services, write Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N.Y.

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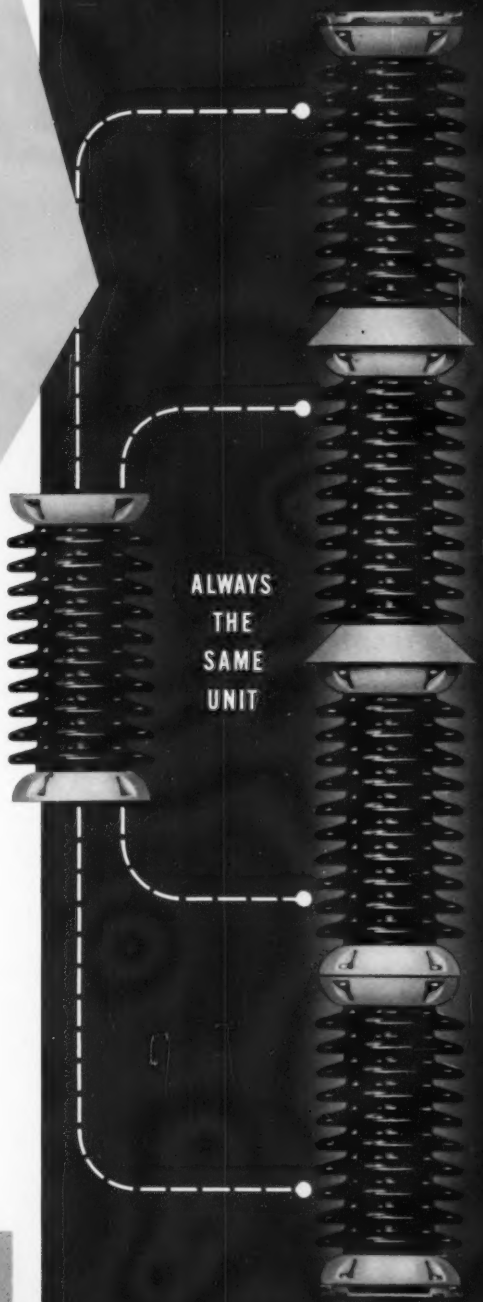
MANAGEMENT CONSULTANTS

NEW YORK
CHICAGO
DALLAS
PORTLAND, ORE.
SAN FRANCISCO
WASHINGTON, D. C.

Stacking post improved

New fully interchangeable O-B Unipost increases stability of stack . . . drastically reduces inventory



Until the introduction of the new O-B Unipost, if you sought the advantages of a stacking station post it necessitated warehousing three separate specialized units: one for top position, one for bottom position, and one for mid-stack locations. Because of small bolt circles and mounting bases that made these units non-interchangeable, you also sacrificed stability in the stack.

As the Unipost name implies, one unit now fits every stack location. Large bases and bolt circles exist throughout. The Unipost has a broad foundation that gives you strength *plus rigidity*.

If you wish to adapt the Unipost to earlier practice or to existing smaller dimensions of associated elements, the Uniplate provides complete facilities for this.

Inventory cost is cut as much as two-thirds - - confusion at the stock room or on the construction site is eliminated - - mechanical factors of stacking posts are definitely improved - - when you insulate your stations with the modern O-B Unipost.

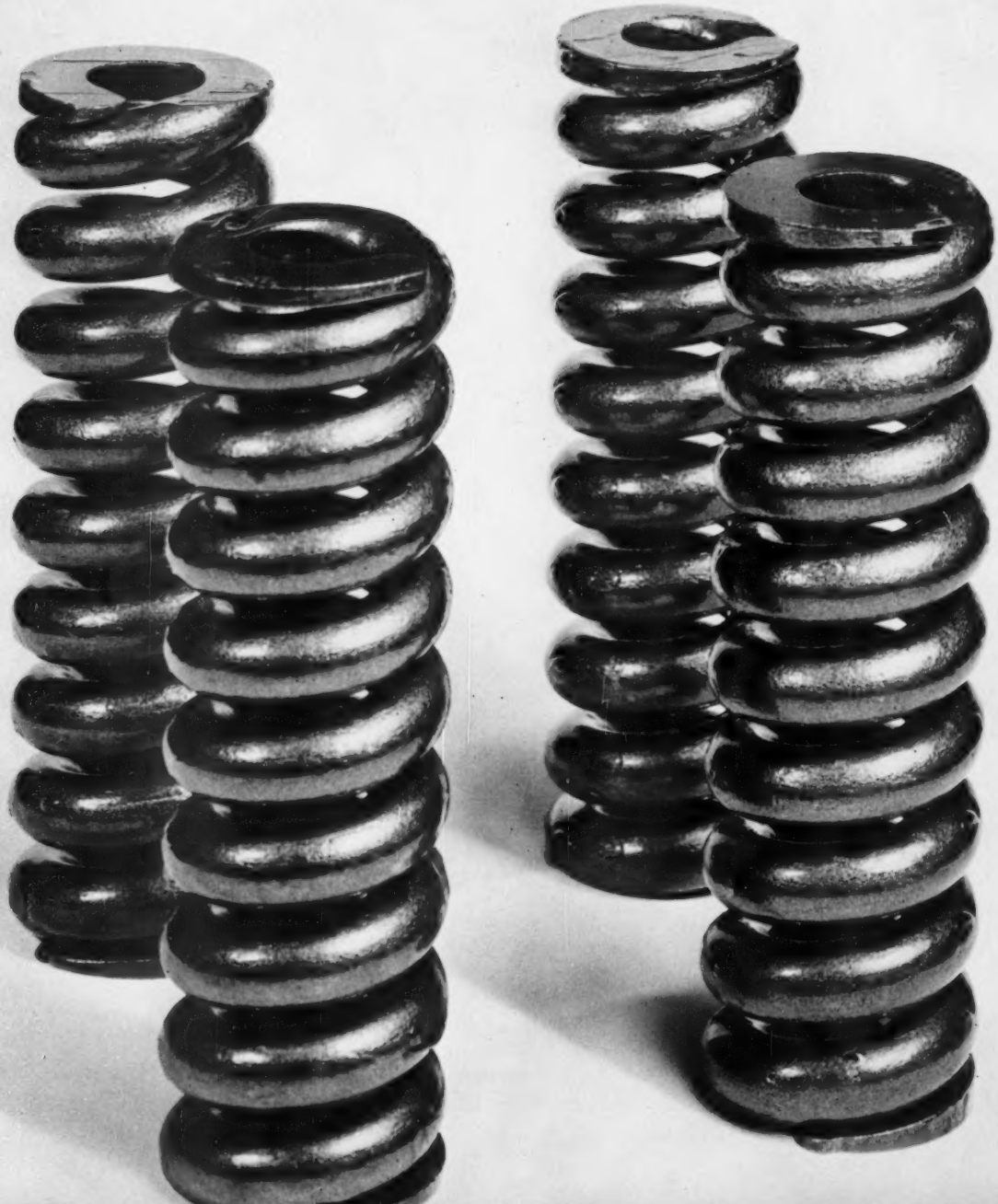
OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10013-H1

Four reasons for a successful bushing



These four massive coil springs are the heart of the compression assembly in an O-B bushing. On installation, they are precision-set to impose an exact, predetermined, live loading on all parts. This is why O-B bushings have such high mechanical strength - - but there's more to the story.

Coil springs maintain a constant optimum compressive force and provide for expansion and contraction of the assembly over a wide range of temperatures. Uniform compression assures maximum life and efficiency of the sealing gaskets. Slight decrease of gasket volume over many year's exposure is fully compensated. Radial shocks of shipping and handling fall on a live-loaded system that is capable of complete recovery.

Long-stroke coil springs in the compression assembly system are just one of many reasons for the success and dependability of O-B bushings - - just one of the things 50 years of experience has taught us.

Simply express your preference, and your new station apparatus will be O-B equipped. Performance records will back this judgment.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10013-H23

Strength and dependability of O-B bushings are assured by live compressive force of long-stroke, coil springs

one solid piece

Thorex station class arrester housings now made in single piece . . . replacing former porcelain-to-porcelain joint

Right from the start, Type MPR Thorex Dynagap station class arresters have had electrically continuous housings. Until recently, however, this required a porcelain-to-porcelain joint at the mid point. Functionally, in every respect, there was no electrical discontinuity. But the design invited improvement.

Ingenious kiln firing techniques have now made practical the production of even the largest arrester housing in the form of one continuous porcelain piece. This practice is now applied to both Type MPR and Type MP, bringing this advantage universally to every Thorex station class rating from 3 to 300 kv.

Continuous housings, at higher voltages, account for the phenomenal performance of Thorex arresters under conditions of severe contamination. Surface leakage currents bleed directly and harmlessly from line to ground over the outside. There are no inter-unit stacking connections to admit these currents into the arrester circuit and cause unbalanced electrical grading.

Even when applied in heretofore "problem locations", single-unit Thorex arresters have performed long and faultlessly. They have honestly won their reputation for top of the market!

Do your plans for construction and modernization include Thorex? Among its other virtues is low installation cost that makes it the biggest bargain in protection.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.

Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10013-H4

Rugged and Dependable

CONDUCTORS
Solid annealed copper, 22, 19, or 16 ga. ASTM designation B-3.

INSULATION
High molecular weight polyethylene, color-coded with compounds to insure electric balance and permanency.

CABLE ASSEMBLY
Varying core constructions available in single insulated conductors, pairs, triples, quads, or composite groups to customer and industry specifications.

CORE COVERING
Non-hygroscopic core tape.

JACKET
Black, high molecular weight extruded polyethylene. Tough and flexible, the jacket withstands exposure to sunlight, temperature extremes and ground chemicals.

SHIELD
Corrugated, longitudinally applied, 5-mil copper tape.

FOOT MARKED
Cable available upon request with sequential foot-marking every two feet.

SUPERIOR Supervisory Control Cable

Quality-constructed SUPERIOR Supervisory Control Cable, type SUP, is specifically designed for electronic control and communication circuits in modern power plants. Rugged and dependable SUPERIOR SUP Cable provides top operating efficiency, economically.

Write for complete details to

SUPERIOR CABLE
SUPERIOR CABLE CORPORATION
Hickory, North Carolina

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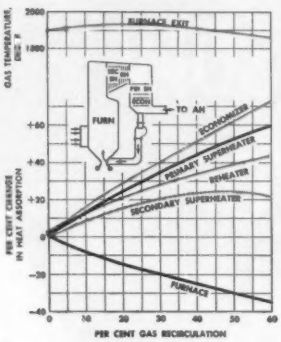
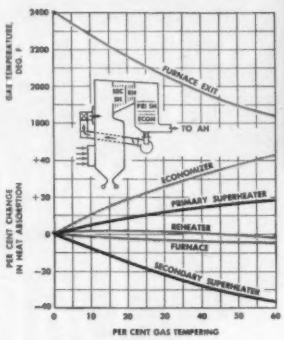
Now—precise heat and temperature control
—where you need it and when you need it

EFFECT OF GAS CONDITIONING

Effect of Gas Recirculation in Hopper
(Constant Firing Rate)



Effect of Gas Tempering at Furnace Exit
(Constant Firing Rate)



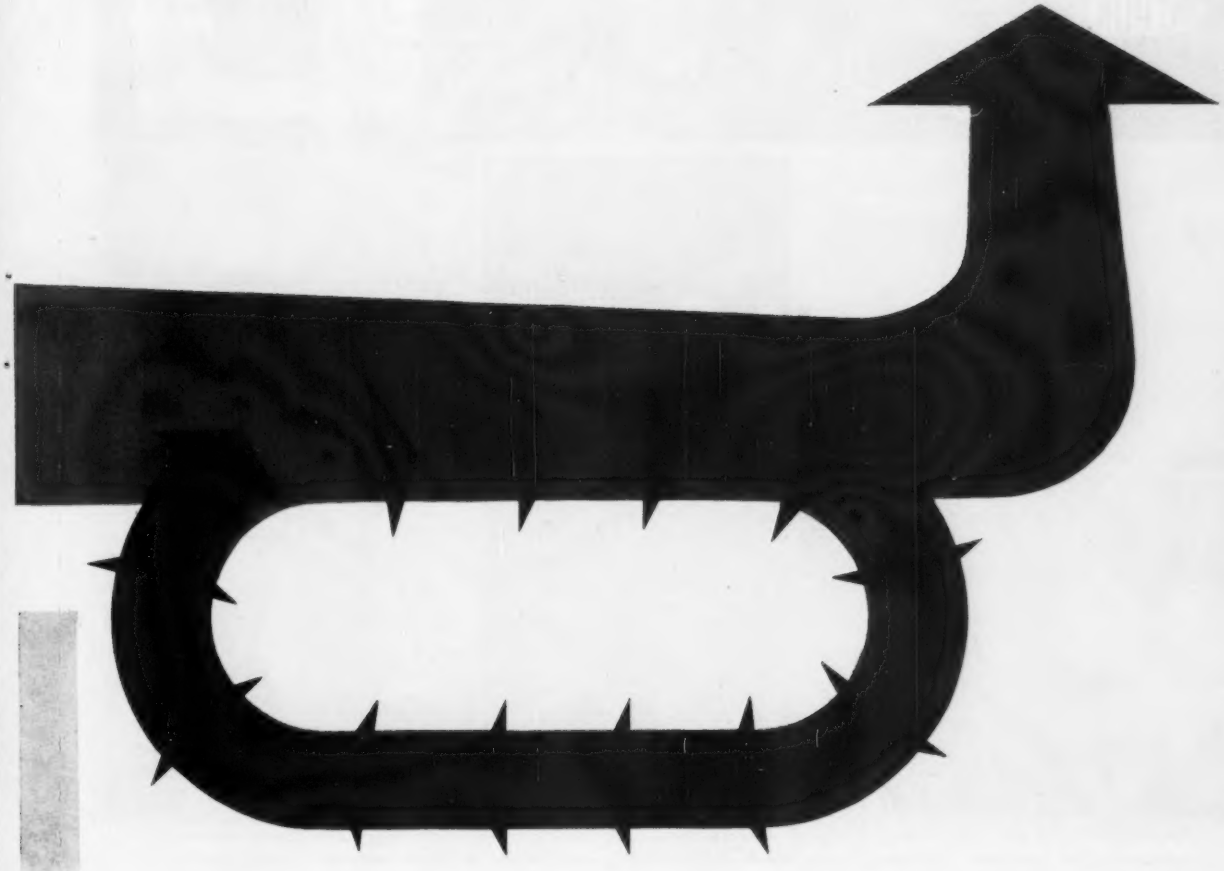
B&W GAS

B&W engineering concept tempers furnace exit gases and controls absorption patterns for improved design, operating and maintenance characteristics

Just as the heating and cooling systems in your home condition air to provide a moderate, healthful atmosphere under the "load" of varying climate . . . B&W Gas Conditioning provides moderated, balanced gas temperature in the boiler under varying conditions of load, changes in fuel characteristics, and varying cleanliness of heat absorption surfaces.

Gas Conditioning is the composite use of "cool" flue gases recirculated either to reduce gas temperature at the furnace exit (gas tempering) or to control heat absorption relationships between the furnace and the superheater-reheater surfaces (gas recirculation).

Increasing load normally brings up gas temperature,



CONDITIONING

however, Gas Conditioning introduces proportioned flue gas to "temper" furnace exit gas to maintain desired temperature. This greatly reduces ash fouling, corrosion and creep of tube surfaces in the superheater, guards against enameling of ash on superheater tubes, and permits a significant reduction in the high alloy requirements.

As load decreases, Gas Conditioning recirculates proportioned flue gas through the furnace, controlling furnace heat absorption and thereby maintaining constant steam temperatures for efficient performance.

B&W GAS CONDITIONING has been soundly proved in operation, and deserves serious consideration in any discussion of new boiler design. Additional information and case history data are available on request. The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

G-968

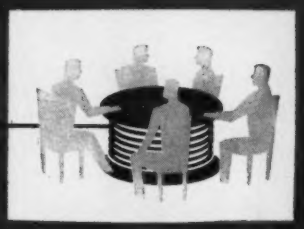
B&W

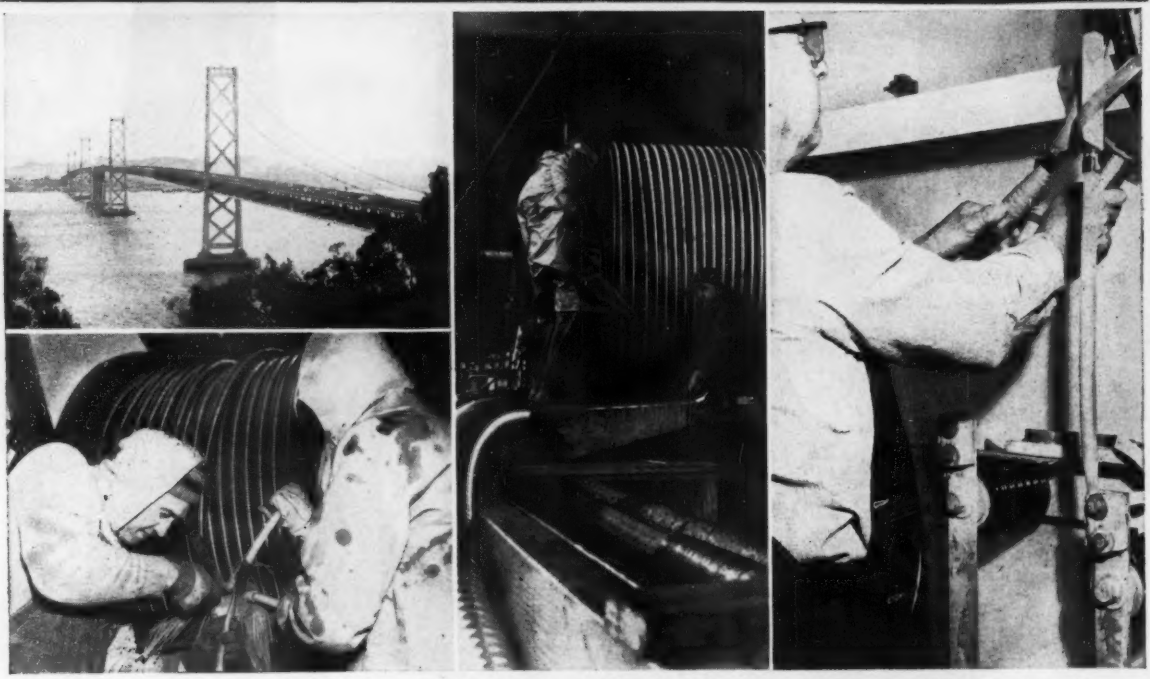
THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

DU PONT

WIRE AND CABLE ROUND TABLE





Workmen install new 15KV cable insulated with ALATHON. The basic rewiring of the famous bridge involves the installation of two new primary circuits, which will conduct power to the two new roadway lighting systems.

General Electric 15KV power cable insulated with ALATHON® being installed at San Francisco Bay Bridge

A four-year reconstruction job, designed to increase traffic capacity by 25-35%, is under way at the famous San Francisco Bay Bridge. An important part in the renovation is the extensive rewiring of the roadway lighting system. To obtain maximum performance at minimum cost, engineers selected 11,000 feet of General Electric 15KV power cable insulated with Du Pont ALATHON polyethylene resin for the job.

The G-E cable utilizes the extremely low power factor and dielectric constant (2.28) of ALATHON. This assures a low dielectric loss and gives the cable a greater load-carrying capacity. And through extensive research, Du Pont has developed a corona-resistant ALATHON to insure even greater long-term reliability. Because of its superior electrical properties, the insulation of ALATHON can be thinner than other materials, making the cable lighter in weight. Thus shipping, handling and installation are easier and more economical.

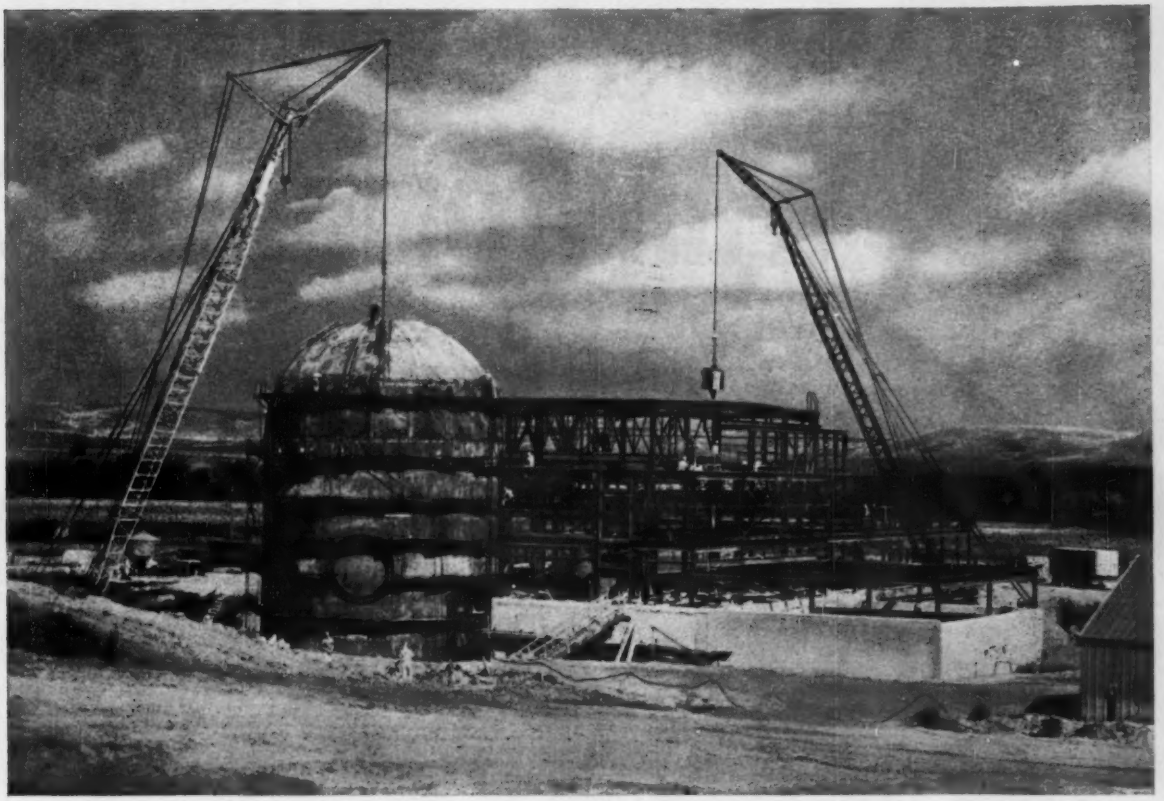
Investigate how ALATHON and the other Du Pont plastics can help solve your wire and cable problems. Contact your wire and cable supplier or write: E. I. du Pont de Nemours & Co. (Inc.), Dept M1017, Rm. 2507A, Nemours Bldg., Wilmington 98, Del. *In Canada:* Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

POLYCHEMICALS DEPARTMENT

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

ALLIS-CHALMERS



A status report:

nuclear superheat...on schedule

"Pathfinder" is the country's first nuclear superheat power station under construction. It is being built by Allis-Chalmers for Northern States Power Company. Cooperating in research and development are nine other midwest utilities* and the Atomic Energy Commission.

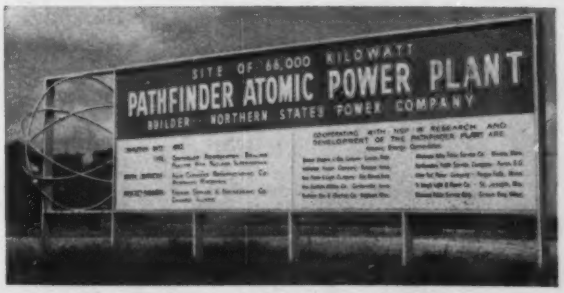
The above photo shows the containment, turbine, water treatment and administration buildings. Construction is on schedule.

The integral nuclear superheater will provide steam at 600 psig, 825 F. Other important design characteristics include a high power density — 46 kw per liter — and controlled recirculation — 60,000 gpm.

Only Allis-Chalmers has experience in both direct- and indirect-cycle boiling water reactors, fast breeder, gas-cooled and process-steam reactors and fusion. In addition, A-C has long been a leader in such steam plant equipment as turbine-generators, condensers, pumps, valves and water conditioning systems.

For more information about Allis-Chalmers facilities and capabilities in the nuclear power field, talk to your nearest A-C representative, or write for *Bulletin 43B9541,* **Allis-Chalmers,** Atomic Energy Division, Milwaukee 1, Wisconsin. A-1382

*Central Electric and Gas Co. • Interstate Power Co. • Iowa Power and Light Co. Iowa Southern Utilities Co. • Madison Gas and Electric Co. • Northwestern Public Service Co. • Otter Tail Power Co. • St. Joseph Light and Power Co. • Wisconsin Public Service Corp.



Site of "Pathfinder" plant at Sioux Falls, South Dakota.

During emergencies, exclusive Allis-Chalmers development will

uprate your transformer 33%

New **Dual-Cooled** *transformers are money-saving advance in system planning...another A-C development pacing power progress*

Pictured here is a *Dual-Cooled* power transformer — the first of two required for Wisconsin Electric Power Company's Blue Mound Station. It's proof that you can now buy *smaller* transformers instead of paying for largely unused standby capacity.

WEPCO takes advantage of both dual-cooling and low ambient temperatures to carry projected peak loads during an outage of one transformer. This means they can buy minimum size transformers — 290 mva — all that is needed during normal operating conditions throughout most of the year.

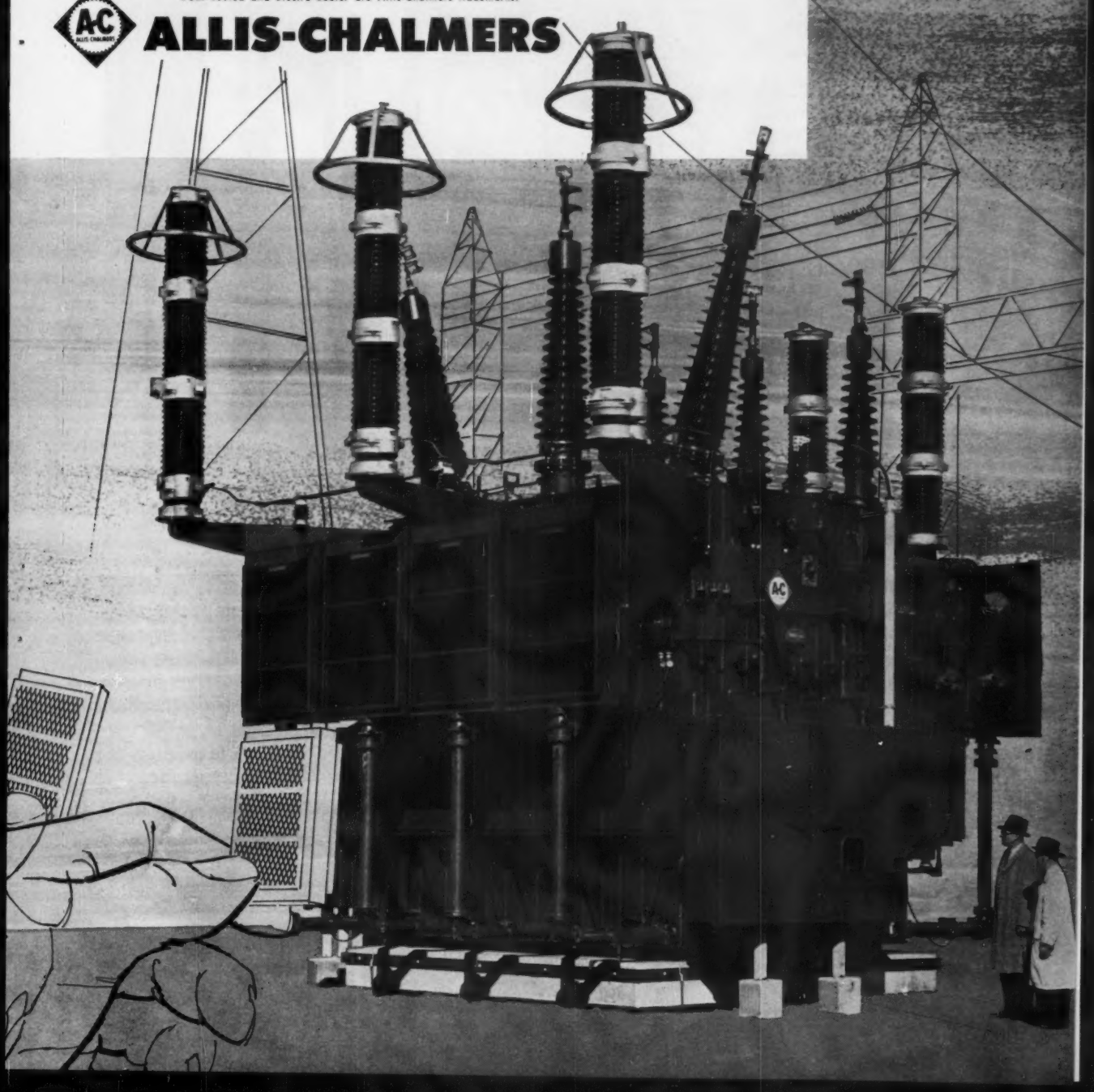
However, during an outage of one unit, 460-mva can be carried by a second transformer at 32 F ambient air temperature. This 460-mva rating (somewhat less at higher ambient air temperatures) is achieved by adding *Electro-Coolers* from the idle transformer. Exchange is made practical *and* without service interruption by use of manual shutoff valves located in each cooler pipe.

You can get Dual-Cooled *transformers in any rating from 20,000 kva up. For full information, contact your nearby A-C office or write* **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wis.*

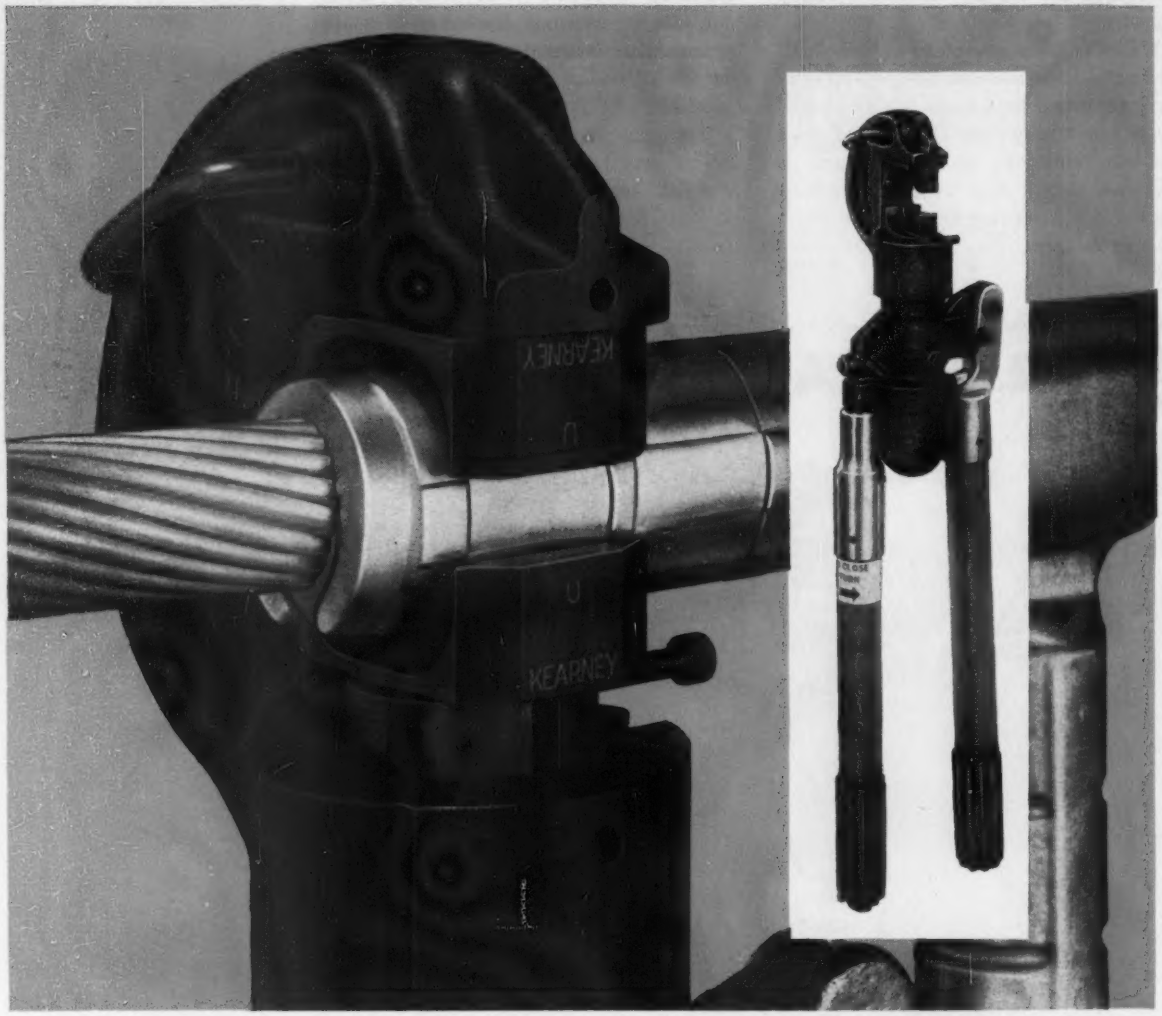
A-1286

Dual-Cooled and Electro-Cooler are Allis-Chalmers trademarks.

ALLIS-CHALMERS



KEARNEY WH-2 HYDRAULIC TOOL AND



This is the tool... Kearney does it again! The Kearney WH-2 Hydraulic Tool—big brother to the WH-1 Tool—is the FIRST and ONLY portable, hand-operated, hot-line compression tool to accommodate such a wide range of fitting and conductor sizes. Equipped with only this ONE tool linemen can now install tap compression connectors on all sizes of energized and non-energized conductors from #6 Solid through 636 MCM ACSR! Die sizes are the same as those for the Kearney WH-1 Tool, plus the additional sizes required to install the larger fittings shown on the opposite page. Dies snap in or out easily . . . can be secured with a set-screw. A two-step, high speed pump generates full 21,000 pounds of thrust. An automatic overload valve prevents over-compression. Large C-frame head allows clear view of work area while making indents. A partial rotation of one handle sets tool to compress or retract dies—no need to remove either hand from handles. Interchangeable insulated handles are available in various lengths to adapt tool to individual voltage requirements.

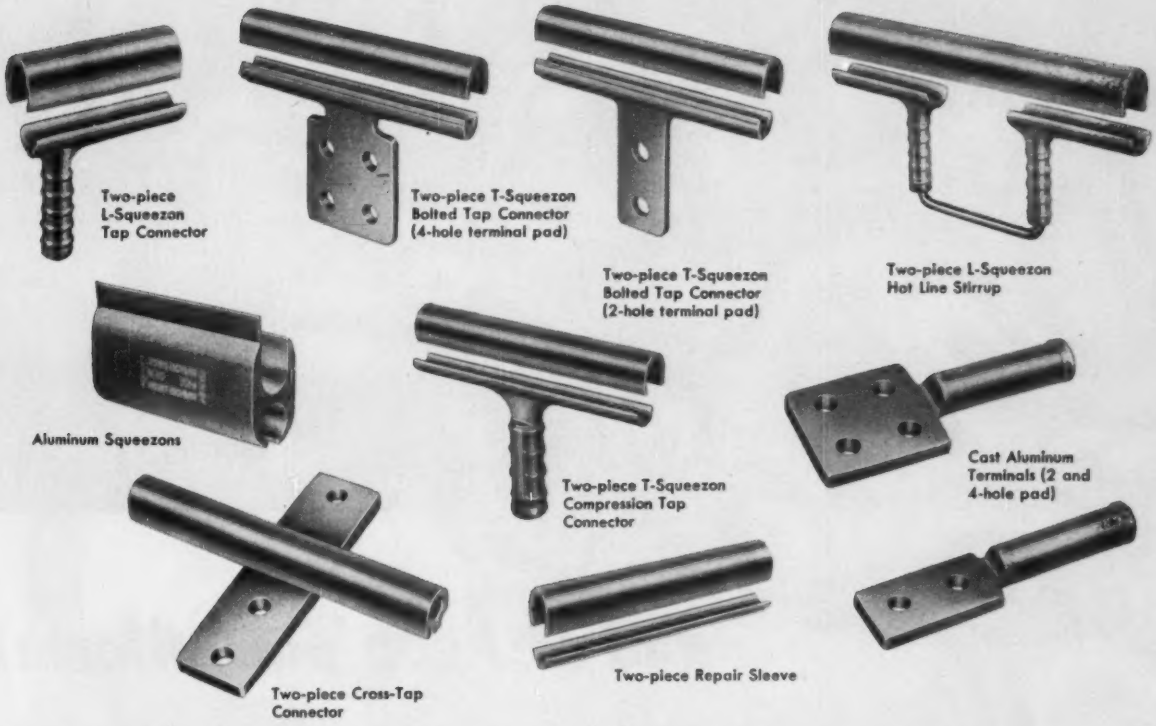
For further information, contact your Kearney

809

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH, IOWA

2-PIECE COMPRESSION CONNECTORS

. . . extend the connection range to include installations on all "Hot" or "Cold" lines from #6 Solid to 636 MCM ACSR


Two-piece L-Squeezon Tap Connector
Two-piece T-Squeezon Bolted Tap Connector (4-hole terminal pad)
Two-piece T-Squeezon Bolted Tap Connector (2-hole terminal pad)
Two-piece L-Squeezon Hot Line Stirrup
Aluminum Squeezons
Two-piece T-Squeezon Compression Tap Connector
Cast Aluminum Terminals (2 and 4-hole pad)
Two-piece Cross-Tap Connector
Two-piece Repair Sleeve

These are the fittings... New, larger Kearney tap connectors and the Kearney WH-2 Hydraulic Tool now extend the tap compression connection range to include installations of highest electrical efficiency on energized or non-energized conductors as large as 636 MCM ACSR. Kearney two-piece aluminum tap connectors accommodate large conductor sizes from 266.8 MCM through 636 MCM ACSR. Tap units slide into and interlock with an encircling sleeve unit. Sleeve for any one conductor size will accept interchangeably various tap units of the same size range. Kearney interlock design aids installation . . . insures uniform compression and full-circumference contact . . . eliminates strand cutting. Sufficient connector mass without excess weight assures cool-running connections. Interchangeability of tap units helps reduce storekeeper inventories.

Also illustrated: Kearney Cast Aluminum Terminals, accommodating wire sizes from #2 ACSR to 1000 MCM Str.; Aluminum Squeezons for wire sizes from #6 Solid to 397.5, line or tap.

sales representative . . .

KEARNEY

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

CLARINDA, IOWA • GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA

We make 'em good . . .

and we keep 'em uniform!

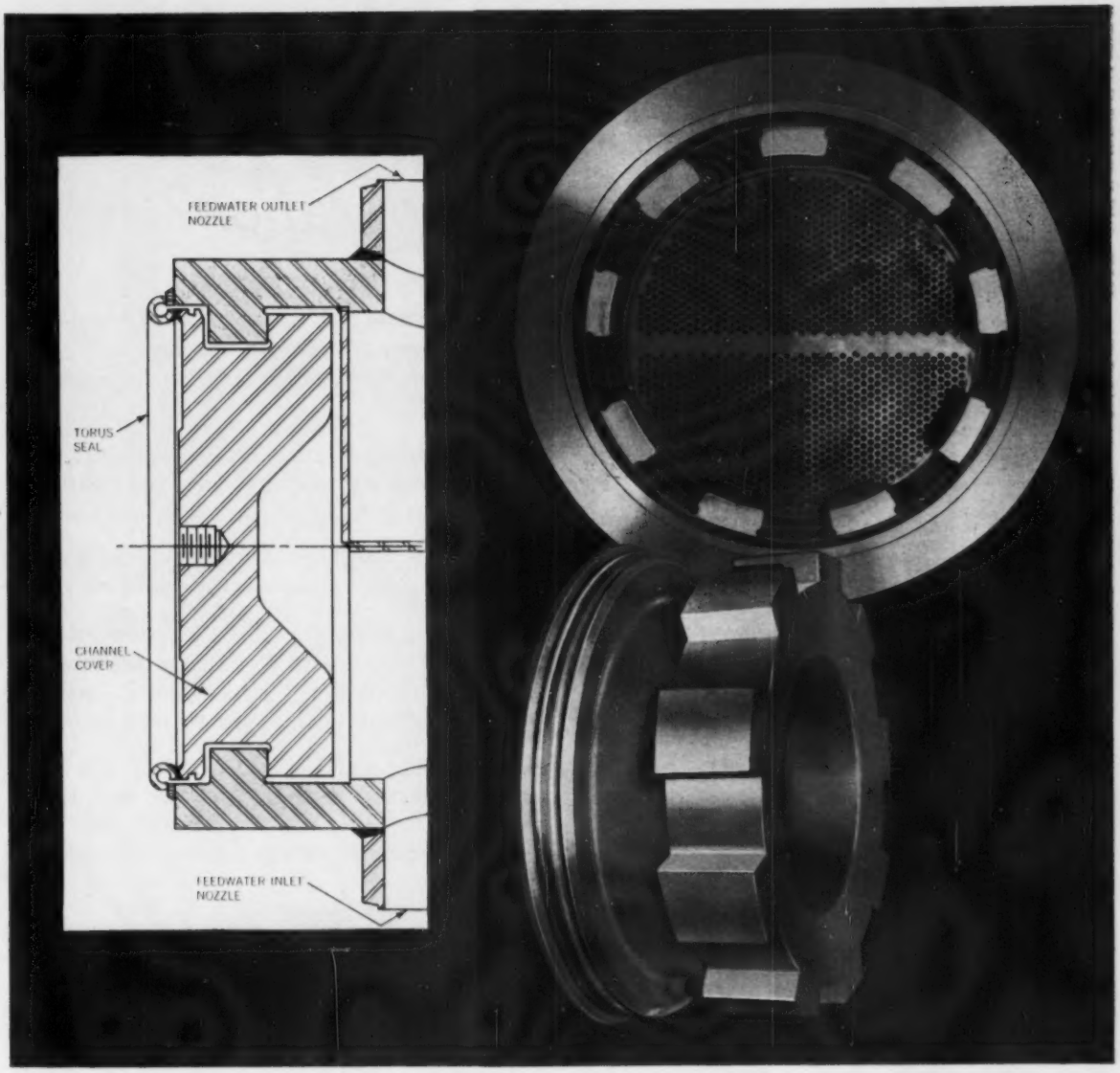
Sometimes you have to build new tools to do the job right. Like this automatic trimming machine. We designed it and built it, here at Lapp, because there just wasn't any other way as good to produce insulator shells precisely right in size and shape.

We're just as finicky about every phase of insulator production, from clay slurry to final flashover testing. We keep 'em uniform. And as we develop new improvements, you get the benefit of them in *every* insulator that leaves our plant.

You can read the results in operating records. Less maintenance . . . lower replacement costs . . . fewer interruptions of service. Because the uniformity of Lapp suspension insulators keeps performance to your specifications. Something to bear in mind next time you order.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



New Breech-Lockhead for Feedwater Heaters

This new closure combines quick-opening convenience with an all-welded seal that is *gasketless*. It is leakproof under the most severe thermal shocks. Yet the pressure cover can be removed quickly with simple tools.

The new Breech-Lockhead closure consists of two parts: (1) a pressure cover that resists the hydrostatic pressure by means of interlocking lugs on the cover and channel, and (2) a torus seal consisting of a partial torus welded to the edges of the channel and cover by a simplified welding procedure.

The torus provides a leakproof seal independent of the hydrostatic pressure on the cover.

Assembly and re-assembly are facilitated by carefully designed tools furnished with the feedwater heaters. The speed, simplicity and ease of the entire operation are worth investigating.

More specific information will be sent on request. Address your inquiries to Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York.

Heat Engineered products, plants and processes . . . for the world's industrial progress.

FOSTER WHEELER

NEW YORK LONDON PARIS ST. CATHARINES, ONT.

What does **Performability** *mean to your fleet operation?*

Your own fleet operation will show real savings and run far smoother with the '61 Lark. Already fleet proven in wide use, The Lark with new improvements and advances has Performability – and here's how you benefit:

Even greater Economy! The all-new Skybolt Six engine, of valve-in-head design and 112 HP, has already shown 17% greater gasoline mileage than Larks used in more than 1000 fleets last year . . . pre-tested and proven in the field by the largest "blue chip" fleet operators!

Even greater Performance! Acceleration your drivers want—10% better at low speeds, 18% better at middle speeds, 35% better at high cruising speeds for safe passing.

Even greater Driver Comfort and Safety! A new recirculating ball steering system and new front suspension make steering 30% easier. Also new for '61—handsome safety-padded dash—increased legroom—smart low-silhouette body styling—increased visibility—oversize bonded brakes! And still those wonderful flat floors, high headroom, big seats, matchless roadability.

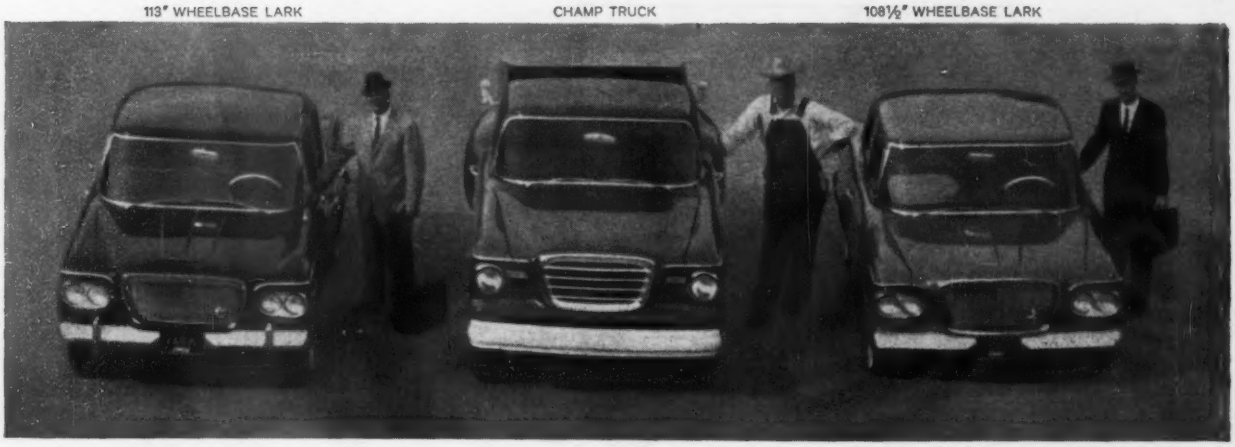
Even greater Maintenance Savings! Fleet records already show The Lark saves ⅓ on maintenance, compared to other cars. But this year new brakes, new larger clutch (for the Skybolt Six) and several servicing improvements (such as a counterbalanced hood) will save you even more.

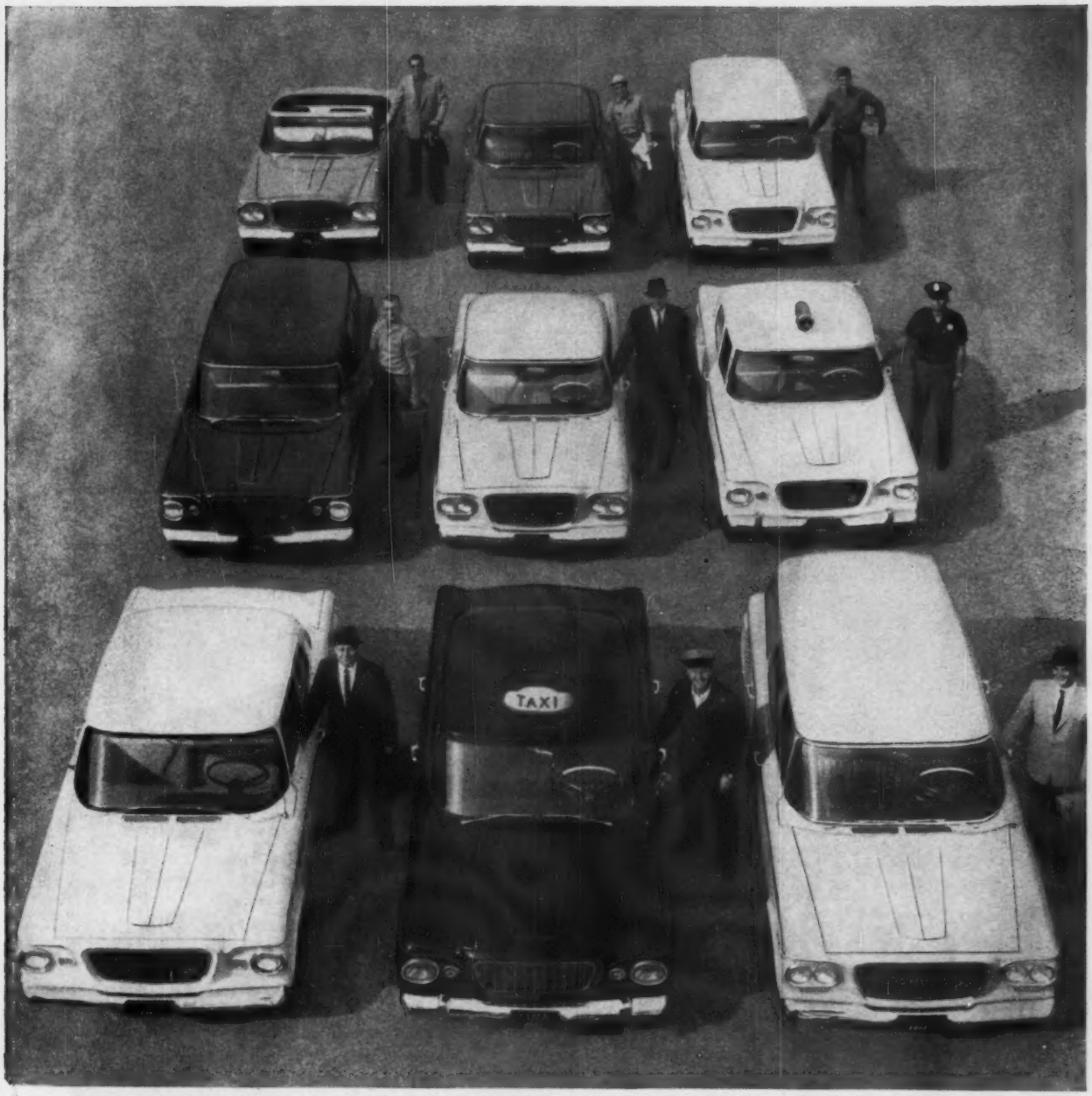
The Sum Total of 2000 engineering and design improvements, perfected and coordinated, give the '61 Lark unique response, economy, durability. That's '61 Lark PERFORMABILITY. You have to drive it to believe it!

NO CLAIMS, NO GUESSES—THESE ARE THE FACTS

Actual field tests by commercial and government fleets show uniform satisfaction—"Excellent acceleration from standing start, good passing performance"..."Good hill climbing"..."Excellent maneuverability and directional stability"..."Exceptionally good (steering) response and light touch"..."Good clutch and brake action"..."Better roadability than any car I have ever used."
Certified by United States Testing Company.

113" WHEELBASE LARK | CHAMP TRUCK | 108½" WHEELBASE LARK





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'61 LARK

by Studebaker

Performability

you have to drive it to believe it!

LET US SEND YOU THE FACTS!

Fleet Sales Division, Studebaker-Packard Corp., South Bend 27, Indiana

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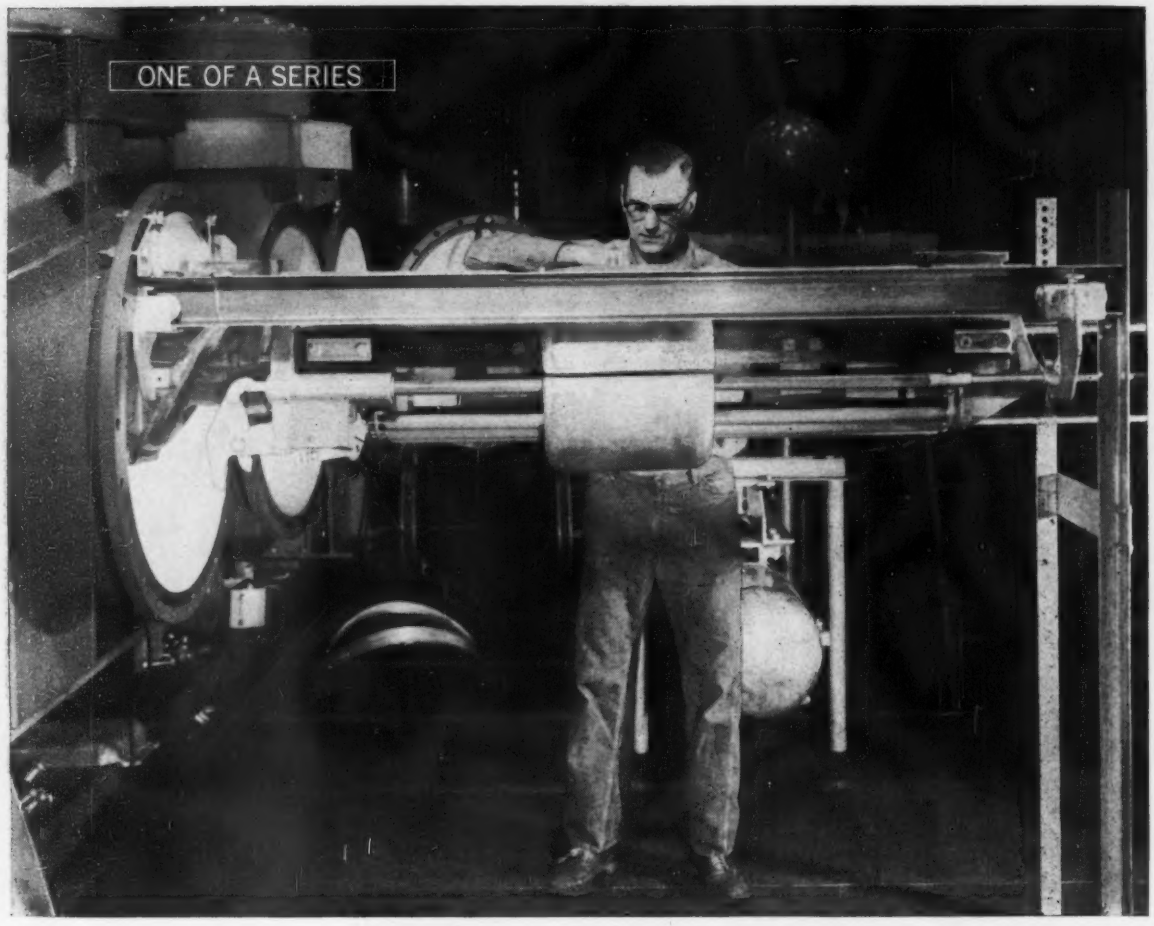


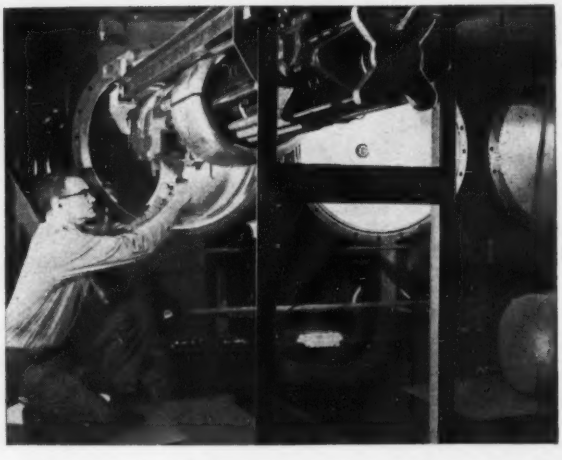
New, Easy, Ground-level Inspection of SF_6 Gas Breaker Slashes Maintenance Costs

provides greatly improved performance from 69 to 460 kv and beyond

A unique horizontal interrupter design in the new Westinghouse gas power circuit breaker now brings the interrupters within easy reach of the maintenance man. No scaffolds, block and tackle or ladders are required to inspect breaker contacts. Now workmen can perform all maintenance comfortably . . . from the ground!

The interrupter can be removed from each tank of the Westinghouse breaker in just 15 minutes.

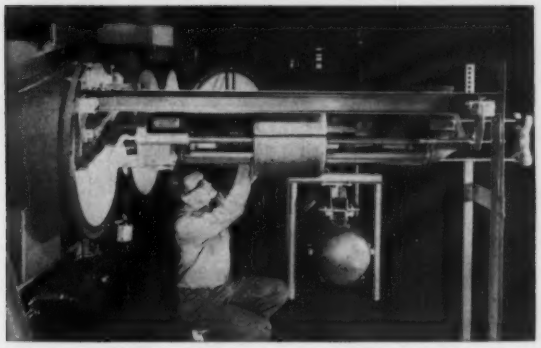
After evacuation of the SF_6, a set of lightweight aluminum rails is installed inside the pole unit. Trolleys are attached to the interrupter; bolts are removed at the bushings, operating rod and high-pressure tube. The interrupter can then be pulled out for inspection. There is no heavy equipment to be lifted! There is no easier way to remove an interrupter.



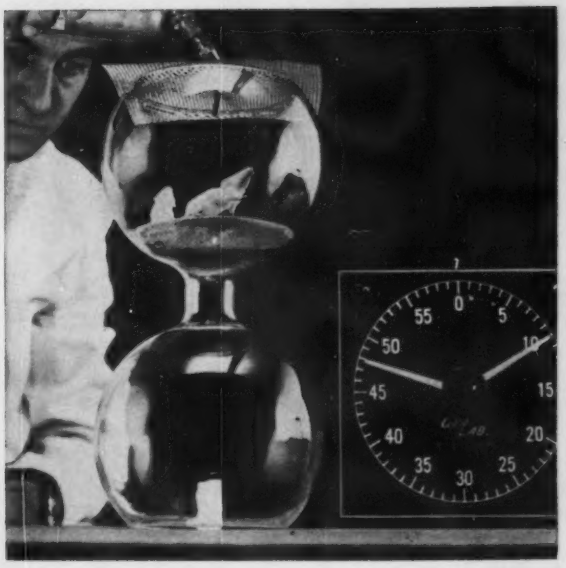
Operation of the interrupter is easily checked by attaching a jack and opening and closing the contacts by hand. This convenient operation-check is another cost-saving advantage over other breaker designs.

The advanced interrupting techniques developed in this new gas breaker, improved contact design and efficiency of the SF_6 (sulfur-hexafluoride) interrupting medium combine to *reduce the need* for periodic maintenance to a fraction of present accepted practice. *Over-all* maintenance costs of the Westinghouse gas breaker are estimated to be less than half those of other breakers.

Extensive field and laboratory experience (since 1953) has proved that SF_6 is completely safe to use



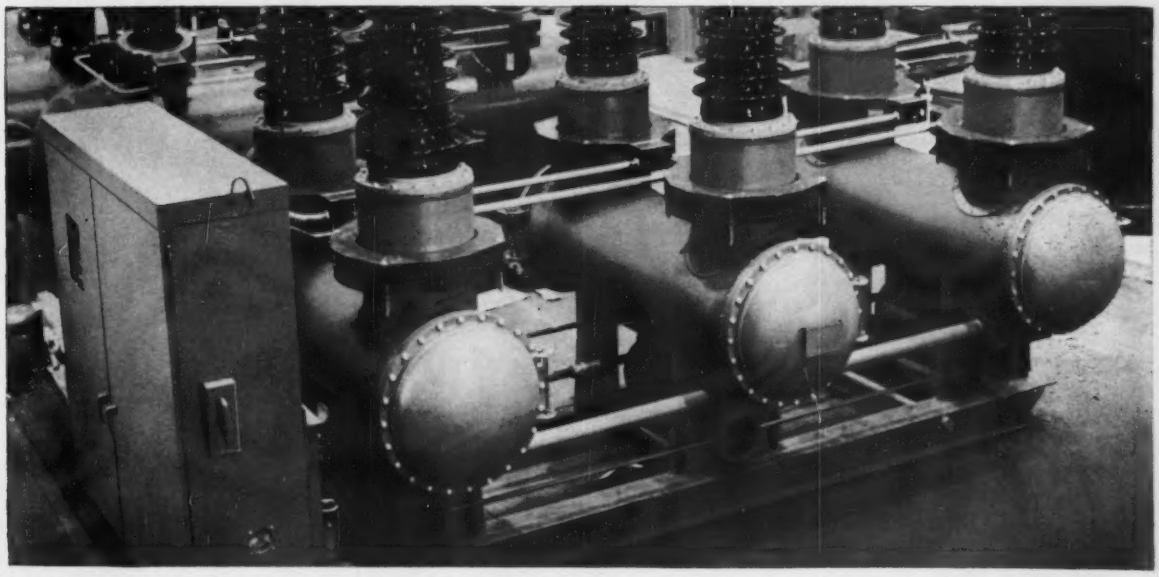
without any harmful effect on personnel. Only precautionary measures of the common-sense variety are recommended. The gas is carefully filtered by activated alumina, as it is circulated in the breaker high- and low-pressure systems, to remove any gaseous arc products. Any solid arc products left in the pole unit after evacuation can be quickly blown out



with compressed air.

This inert, nonflammable, nontoxic gas is heavier than air as demonstrated in the laboratory experiment above. The SF_6 sinks to the bottom, snuffing out the candle. Tests show that the mice can live in a mixture of 80% SF_6 and 20% oxygen for 24 hours without ill effect.

To learn more about the way the Westinghouse gas breaker can cut installation and maintenance costs and increase breaker performance, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse. J-61006



Westinghouse Gas Breakers for Improved Performance from 69 to 460 Kv and Beyond

Westinghouse

Photo courtesy of San Francisco Chamber of Commerce

Golden Gateway

Beautiful, cultural, cosmopolitan San Francisco is the center of the West Coast mining area, processor of California's fabulous fruit and farm crops, and one of the nation's major distribution points and financial areas. Its importance as a western rail terminal has grown ever since the final spike was driven in the first transcontinental line, and four Class I railroads now serve the city. One of the country's outstanding electric utilities has stimulated growth by serving expanding power needs.

Kerite has anticipated and met the constantly increasing demand for electric cable, with a standard of dependability which began in 1854. *And as the need for quality cable continues to grow, Kerite will be ready to supply it.*

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Electrical World

OCTOBER 17, 1960

Editorial Comment

The GE Strike—Who Shares Productivity Gains?

In its broadest terms the strike which continued at General Electric Co last week may be viewed as a struggle over the fruits of productivity.

The progressive manufacturer continually strives to improve his operation—to increase the efficiency of his work force. In the US, increases in efficiency are generally taken to mean greater production per man-hour—often expressed as "productivity."

Because the early post World War II period was a sellers' market, labor unions were able to bargain successfully for the full share of productivity gains and more. Manufacturers were able to pass along the higher labor tabs in the form of higher price for products.

Now we come to the period of a buyers' market. Besides the overcapacity of domestic producers, the threat of foreign competition acts as a further depressant on prices. Thus the manufacturer is looking for ways to trim prices—not to raise them. The buyer is now able to demand a share of the productivity gains.

General Electric appears to be recognizing this situation in its current labor negotiations. Its standing offer seeks to share future productivity gains with customers as well as with the employees. In this effort, the company has the support of a number of its customers. We believe it deserves the support of all.

Investor-Owned Utilities Are Moving Ahead

As we have noted on this page in the two previous issues, Democratic campaign orators are implying that long-term economic growth will not be achieved without a big push from the federal government.

In the electric utility field, the investor-owned companies are highly capable of moving ahead on their own initiative.

This was forcefully pointed out at the recent dedication of the Breed Station 475-Mw steam unit on the American Electric Power Co system (see page 50). At the ceremony, AEP Pres Philip Sporn noted that his company had added more capacity in the last five years than the Tennessee Valley Authority added in hydro during its first 20 years. He also noted that AEP postwar expansion had required over $1.5 billion in private capital.

There are other investor-owned companies that have invested as much or more in expansion during the postwar years.

We emphasize that this sort of enterprise, this sort of planning, this sort of building is ample evidence that the investor-owned companies have moved ahead and will continue to move ahead without the heavy-handed benevolence of the federal government.

FPC Staff Report

Gives Edge to Mountain Sheep

No mention is made of comparative fish problems nor geological conditions at the Nez Perce site

The High Mountain Sheep hydroelectric project appears to have taken the laurels from Nez Perce in a first-round filing of engineering data on the two projects by the Federal Power Commission staff.

The FPC staff report—not intended as a recommendation—was prepared as a "neutral and factual" summary of engineering data on comparative aspects of the two projects. The staff recommendation—for one of the projects, or possibly against both—won't be made until the upcoming hearings have been completed. They are scheduled to begin November 4.

Portland GE Officials Comment

Portland General Electric Co officials indicated surprise and disappointment that the FPC staff made no mention of the comparative fish problems and facilities between High Mountain Sheep and Nez Perce.

This issue, they point out, is the rock on which they think Nez Perce will founder. By leaving this out of its report, the FPC staff "tended to equalize" the two projects, they said.

Another point which PGE officials felt was erroneously deleted from the staff report was whether the geological conditions at the two sites are adequate. Mention has been made previously of a questionable, faulted area near the Nez Perce site, but the FPC staff didn't comment on this.

High Mountain Sheep's benefit-to-cost ratio was computed by the FPC staff higher than that for Nez Perce: 1.47-1 for High Mountain Sheep (at 5.5% interest during construction) against 1.22-1 for Nez Perce (at a 5.5% interest rate). The staff pointed out that if Nez Perce interest was only 5%, the ratio would be higher, 1.28-1; and if it was only 4.5%, the ratio could go up to 1.35-1—still lower than for High Mountain Sheep, however.

Wilfrid A. Froggatt, FPC engineer in the San Francisco office, said that High Mountain Sheep's capital cost would be $190,652,000 at 5.5% interest rates. He added that the dam's annual costs would be $27,937,000, and its annual value over costs would come to $13,148,000.

Nez Perce costs were figured by Froggatt at three interest rates—at 5.5%, Nez Perce capital cost would be $425,914,000, annual costs would be $43,474,000, and its annual value over cost would be $9,579,000; at 5%, Nez Perce capital cost would be $413,007,000, annual costs would be $40,346,000, and annual value over costs would be $11,427,000; at 4.5% interest, Nez Perce capital cost would be $400,867,000, annual costs would be $37,433,000, and annual value over cost would be $13,131,000.

Power Market Value Estimated

Another engineer in the FPC San Francisco office, James L. Lisk, determined High Mountain Sheep's weighted market value of firm power at $25.91 per kw-year. He chose Spokane, Portland and Anaconda, Mont., as market centers for the power, to be delivered over 230-kv lines. He said energy would be valued at 3.8 mills per kwhr. High Mountain Sheep's year-round dependable capacity would be 930,000 kw, based on January capacity.

Lisk figured Nez Perce's firm power market value on three construction interest rates: $19.99 (5.5%), $18.46 (5%), $17.77 (4.5%). This was based on market load centers of Spokane, Lewiston, Ida., Santiam, Ore., McNary Dam, Wash.-Ore. border. Lisk said Nez Perce energy would be valued at 2.37 mills per kwhr, and the dam's year-round dependable capacity, based on January conditions, would be 1,867,000 kw.

Comprehensive development of the middle reach of the Snake and Salmon rivers—judged on alternate plans for unbuilt projects—again favored High Mountain Sheep and Lower Canyon over Nez Perce and its related White Bird Dam, testified Allan J. Meadowcroft, a third FPC engineer in the San Francisco office. He said High Mountain Sheep, along with Lower Canyon, Hells Canyon, Freedom and China Gardens Dams, would produce more prime power at lower cost than a combination of projects including Nez Perce, White Bird, Freedom, Hells Canyon and China Gardens Dams. Meadowcroft made estimates of the plans for years 1969-70 and 1984-85, both showing the Nez Perce combination requiring higher annual costs than the High Mountain Sheep combination.

Both High Mountain Sheep and Nez Perce Dams met minimum requirements for maximum and low-level water discharge, said FPC Engineer Jack M. Shepley, in the Washington office. Shepley added that both dams' arch designs appeared to be structurally sound, although excessive tension stresses appeared in both dams' "crown cantilevers," and a greater curvature might be advisable. Shepley added that the two dams' design and structure were good, if geology was found to be adequate—he didn't

comment on this. Shepley also said that both spillway designs needed checking on hydraulic models.

A number of other intervenors also filed comments in the case—mostly fish and game groups concerned about migratory fish passage over the proposed high dams. Most of these groups preferred High Mountain Sheep to Nez Perce as the lesser of two evils, although several limited their comments to opposition only to Nez Perce. A few intervenors came out in favor of Nez Perce.

The fish and game commissions of Idaho, Washington and Oregon, in a consolidated statement criticized both projects as damaging fish, but added that since "political pressure" would insist on one of the two projects being built, "a simple matter of arithmetic" favored High Mountain Sheep because it would be less damaging to fish.

Intervenors Raise Fish Question

The Idaho Wildlife Federation criticized Nez Perce because "no practical plan has yet been devised to successfully pass andromodous fish up and down over a 600-ft height of Nez Perce Dam." The Federation referred to "extensive expressions" against Nez Perce among its members who "can hardly believe anyone would have the effrontery to cut off the salmon and steelhead (fish runs) from the Salmon River."

The Washington State Department of Conservation came out for Nez Perce. Its director, Earl Coe, said he had "concluded unequivocably" that Nez Perce "best provides for the control of floods, improvement of navigation, development of natural resources and supply of power for public interests" in the Pacific Northwest.

The Washington and Oregon State Granges backed up Coe, stating their views that Nez Perce would provide more and cheaper power, plus prevent the "monopolization" of power development by private interests.

Another group of fish interests filed a consolidated series of statements against Nez Perce, including: Washington State Sportsmen's Council, Inc, Fishermen's Cooperative Assn, Inc, Northwest Fisheries Assn, Alaska Fishermen's Assn, Pacific Fish Conservation League and the Makah Indian Tribe.

High Cost of Nuclear Power Development Deters World Fuel Supply Conservation

Atomic power—if it can be developed on a truly low-cost basis—could unlock the full energy content of world nuclear energy resources, which roughly double the estimates of "ultimate" fossil fuel reserves.

This major conclusion emerges from a year-long factfinding review of "International Atomic Policies and Programs of the United States," performed by Robert M. McKinney for the Congressional Joint Committee on Atomic Energy. McKinney, publisher of the Santa Fe New Mexican, was first US representative to the International Atomic Energy Agency in Vienna.

In a 78-page summary of the five-volume report, US international policy aims since 1953 making use of peaceful applications are examined, essentially, against a background of atomic power generation—as the primary civilian use of the atom—and world energy supplies and requirements.

McKinney found that the international policies to bring the benefits of peaceful atomic uses to all people, to strengthen peaceful relationships between countries, and to help raise world standards of living hinged on the common acceptance and construction of nuclear power plants throughout the world. Encouragement for other countries in the form of US assistance programs, subsequently, stemmed from the specific expectation that atomic powerplants of all types and sizes would quickly become competitive with conventional powerplants.

But precisely the opposite has taken place, the report says. Seven years later, atomic power reactor technology has not advanced rapidly enough to overtake stabilized or decreasing conventional fuel costs.

"Government and private experts agree that no atomic power plant has yet been purchased by any utility organization on a straight commercial basis in competition with the most economically attractive conventional plant of comparable size which could be built at the same location," the McKinney report said.

To displace conventional power on any considerable scale, according to McKinney, atomic power must offer appreciable rather than merely "marginal" cost advantages.

The report recommended as a major change in future US planning that research focus on vast, low-cost nuclear energy rather than on the marginal near-term goal of achieving "competitiveness' with fossil fuels.

Beyond the year 2000, the report indicates that the non-interruptible resources necessary to support expanding world populations, both in developed and underdeveloped regions, would begin to tax the finite limits of conventional energy resources (estimated at 4,939 billion short ton coal equivalent for the free world). But assuming high efficiency utilization in breeder reactors, free world atomic reserves (thorium and uranium recoverable at $10 per pound) could be equal to 14,000 billion tons of coal equivalent.

Conventional world energy supplies—taken from new forecasts appended to the report—are estimated as 8,993 billion short tons of coal equivalent. Energy requirements by 1975 will soar to 8,742-million tons coal equivalent annually; and to 16,856 million tons by 2000. At 1975 energy consumption rates, nuclear reserves would be over 30 times the free world annual requirement based on less efficient utilization of present atomic power technology. At year 2000 annual energy consumption rates, assuming the higher breeder reactor efficiencies, nuclear reserves would last for more than 1,000 years.

The report saw little hope for reducing heavy capital costs of reactors over the next decade. It found that by 1970, capital costs per installed kw of coal, oil or gas-fired conventional power plants will be $90-175. Cost of electricity in mills per kwhr will range from 5.0 to 7.7. Comparable nuclear costs, however, are $180-290 per installed kw and 7.1-8.3 mills per kwhr, covering light water, organic, gas-graphite and heavy water reactor types.

Stock Option Hassle Before SEC

It's now up to the Securities & Exchange Commission to decide whether Middle South Utilities, Inc, will become the first registered electric utility holding company to be able to issue stock options to its executives. The company presented its case recently in an oral argument before the Commission.

Approval of the Middle South petition would set a precedent for similar plans by other utility holding companies under SEC jurisdiction.

The SEC staff, however, strongly opposes the utility's plan, objecting to every single argument the company has raised (EW, May 30, p 27).

Dan James, Middle South attorney, told the Commission that his company needs the stock option plan to hold on to its present executives, and to induce capable young men to come into the company. He said Middle South's inability to set up a stock option program had cost the company the services of at least one high-ranking executive, while the company also had lost out in recruiting some outside talent for the same reason.

There's little incentive in salary boosts for already highly-paid executives, said James, because income taxes eat up most of the increases. The only real incentive open to a utility for its executives is the chance for capital gains through a company stock option program, he added, and at present, Middle South is at an unfair disadvantage when it competes for high-caliber personnel with other utilities not subject to the Holding Company Act—and therefore not forbidden by the SEC from maintaining stock option plans.

James said Middle South hoped to distribute up to 120,000 shares of its common stock in the proposed program. It would apply only to executives of the holding company, and not to any of Middle South's subsidiaries.

Court Action Foreseen

The company also took issue with the SEC staff's objection to certain testimony, presented by Middle South, relating to the legislative history of the Internal Revenue Code and its amendments (1950 and 1954). James said this testimony was necessary as background to understand the intent of Congress as it applied to stock option programs. It would be "reversible error," he added, if the SEC were to refuse to consider such testimony in its ruling on the company's petition.

The reference to reversible error implies that Middle South now plans to take the case to court, if it loses its case before the SEC. It probably will take several months, however, before the Commission issues its ruling.

The SEC staff cited about the same arguments that it used against the Middle South plan in its brief filed last May. Solomon Freedman, assistant SEC director of corporate regulation, charged that:

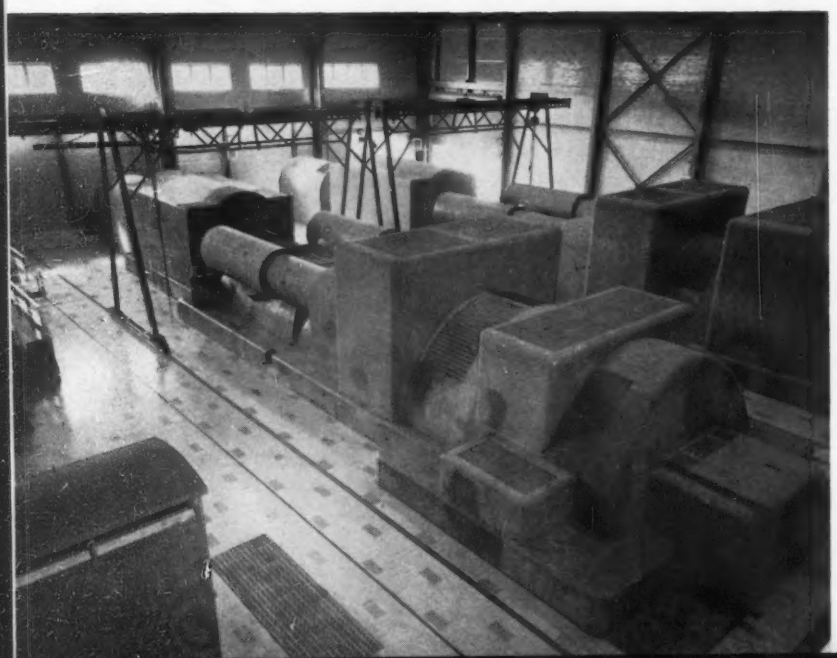
(1) Middle South did not need additional incentives for its executives;

(2) The proposed plan would run counter to the wording of the Holding Company Act—and no other legislation is applicable;

(3) The proposed plan would affect adversely both Middle South stockholders and general public.

Freedman charged that Middle South's testimony concerning Congressional intent in the Internal Revenue Code amendments was irrelevant since that act was general tax legislation and not related specifically to the special circumstances involving holding companies. He emphasized that the Holding Company Act gave SEC the authority to prevent stock option plans.

The SEC staff attorney also hit at Middle South's proposed plan as hurting present stockholders and customers because it would result in the sale of more stock for less money than Middle South could realize through normal marketing procedures.

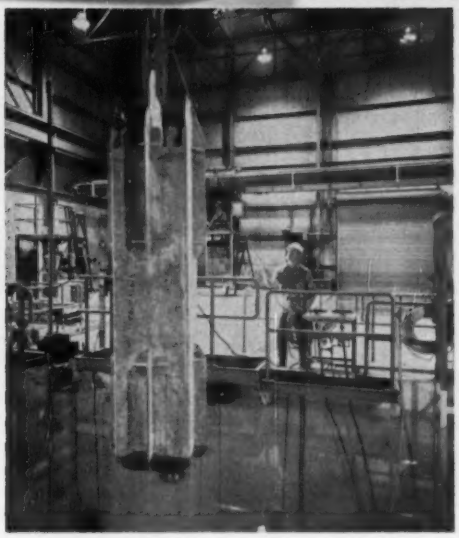


Largest and

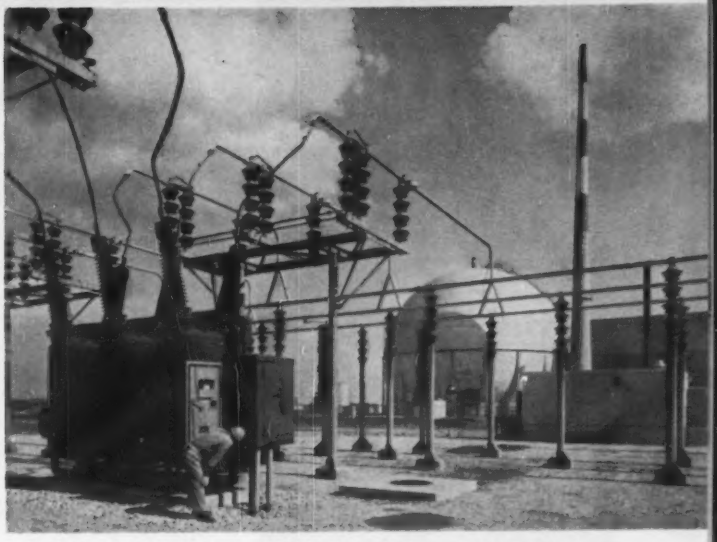
A super steam plant was commissioned near Terre Haute, Ind., Oct. 6 when the $71-million Breed Plant of the Indiana & Michigan Electric Co underwent dedication formalities.

Breed's one 475-Mw unit is larger by 40% than any unit now in commercial operation. And its design heat rate of 8,530 Btu per kwhr—fairly well verified by commercial operation since July 31—tops the world's best by about 6% under its nearest contender.

The plant boosts capacity of the American Electric Power Co (parent of I&M Electric) to over 6,000 Mw, making it the world's largest in-



FUEL RACK BASKET is lowered into storage pool prior to being loaded with uranium fuel



DISTRIBUTION SYSTEM is checked over by plant technician. 190-ft-dia steel sphere contains reactor, generation equipment

Dresden Ceremony Draws Large Audience

Dedication ceremonies marking the commercial operation of Commonwealth Edison Co's Dresden Nuclear Power Station aroused such interest that facilities for the event had to be expanded.

Several hundred guests were expected at the Columbus Day ceremony; an estimated 2,000 attended. This unexpected show of interest in the $50-million, 180-Mw plant caused Commonwealth Ed officials to expand ceremony facilities and schedule public tours of the plant for later this fall.

Congressman Melvin Price (D-Ill.) injected a semi-political note into the ceremony by asserting that ". . . no matter how things turn out in early November, the government will have to continue to pay a large financial, as well as regulatory, role in the development of atomic power."

John A. McCone, chairman of the Atomic Energy Commission, was principal speaker. Ralph J. Cordiner, chairman of the board of General Electric Co which designed and built the plant, presented to Willis Gale, Commonwealth Ed chairman, the original switch which started the first chain reaction at Dresden a year ago. The switch was used when electricity was first produced there last April 15 and when the plant was brought to full power June 29.

The plant, which uses a boiling-water reactor and is located 50 miles southwest of Chicago, is the nation's first full-scale, privately-financed nuclear station.

Other speakers included J. Harris Ward, Commonwealth Ed president; Illinois Gov William G. Stratton; and Chicago Mayor Richard J. Daley.

Most Efficient Plant, Breed Is Dedicated

vestor-owned electric system by generating-capacity measure.

About 500, mostly from I&M service area or from Terre Haute vicinity, attended the ceremonies, which included the usual walk-throughs and congratulatory speeches. Though few had entered a power station before, the 23-story-high steam generator, 550-ft stack and clean, massive plant obviously impressed them.

AEP Pres Philip Sporn took occasion to puncture publicly those who deny US investor-owned utilities have ability to pace the economy's growth.

AEP has added more capacity in the last five years, Sporn rasped, than TVA added in hydro in its first 20. And the AEP postwar expansion alone required over $1.5 billion in private capital. Thus "the Breed project, all that has preceded it, all that is now planned," prove private enterprise not only *can* do the job, but *has* done it.

Breed is considerably outside I&M service area, tied via double-circuit, 186-mile, $22-million, 345-kv transmission to South Bend, where heavy transmission connects west to Chicago and east to I&M and AEP systems.

Breed's 3,500-psi, 1,050F/1,050F/1,050F steam conditions are not revolutionary. Its 107-Mw prototype, Philo No. 6, was 4,500 psi, 1,150F initial temp and also double reheat. Retreat from Philo's test extremes confirms general dissatisfaction with cost and reliability of austenitic materials at this level (see EW, Oct. 3, p 33).

"Minor engineering changes," following full test, will boost capability to 500 Mw, Sporn said. Philip Sporn No. 5, a sister unit, is under construction by Ohio Power Co.

Now whence AEP steam pioneering? Says Sporn: Units built on Breed and previous experience "will probably be bigger . . . and they in turn will establish new milestones."

AUTOMATION SPOKESMEN E. H. Snyder, Public Service E&G; D. M. Sauter, Westinghouse; W. L. Chadwick, So Cal Edison; W. L. Gaines, General Electric; D. E. Heyburn, B&W Co; E. G. Noyes, Westinghouse

SO CAL EDISON'S W. L. CHADWICK

Power Plant

First two US power plants operated by computer control will more than pay cost of automation with savings resulting from eliminating lost operation due to accidents, utility executives tell National Power Conference

■ The consuming interest of engineers today in computer control of power plant operation was never more evident than at the recent National Power Conference. Wall-to-wall audiences jammed the Rose Garden Room of Philadelphia's Bellevue-Stratford Hotel to learn at first hand details of Huntington Beach and Little Gypsy installations, and to hear questions of economic justification and design philosophy discussed by power company executives responsible for the first two automatic power plants in the US.

Neither W. L. Chadwick of Southern California Edison Co nor W. T. Hess of Louisiana Power & Light Co left any doubt that these two pioneer installations can be fully justified out of savings in lost use of capital resulting from major power plant accidents.

COMPUTER CONTROL SPEAKERS W. T. Hess, Louisiana P&L; F. W. Lyle, Daystrom; T. W. Jenkins, Leeds & Northrup; Ross Forney, Forney Engineering; C. F. Paulus, Cleveland Electric Illuminating, and J. G. Miller, Metropolitan Edison

Chadwick said that loss of availability of a large unit can cost more than $10,000 a day. Elimination of 120 days of lost operation during the life of such a unit, he said, will more than pay for an entire computer control installation. Hess was no less emphatic on this point. Probability is 1 in 3, he said, that a serious accident will happen some time during the life of a generating unit. Hess said that the cost of such accidents has been $600,000 each for the last ten which occurred on the Louisiana P&L system.

So Cal Edison's decision to build computer controls into four major generating units was based on seven factors, Chadwick said:

1. Need to use every reasonable means to avoid non-operation of high cost combustion and rotating equipment;

2. Faster and safer analysis of fault conditions;

3. Faster scanning of more points for alarm deviation;

4. Saving in loss of capital use due to accidents;

5. Savings in operating labor for new installations;

FOR ACHIEVEMENT in the field of power Ernest C. Gaston, president, executive division, Southern Services, is presented with George Westinghouse Award by Dean D. E. Marlow, Catholic Univ, Washington, D.C.

AIEE PRESIDENT CLARENCE LINDER

Automation Fully Justified

6. Reduced maintenance by earlier detection of fault conditions;

7. Constant supervision of temperature changes.

While justification for computer control was clear, same authors saw need for better control components before complete and optimum control of steam plants is an accepted reality. W. L. Gaines, L. F. Kennedy and A. M. Spielberg of General Electric Co, for example, called for

- New and more accurate sensing equipment;
- Better equipment and techniques for coal calorimetry and flame detection;
- Better knowledge of the interaction of plant equipment.

Babcock & Wilcox Co's G. W. Kessler said the ideal flame detector hasn't yet been made but that a workable one is available. Other weak links in automation listed by Kessler were: pressure switches, electrical contactors, solenoid valves, gas analyzers, flow measuring devices and sampling equipment. But on the plus side he listed these boiler innovations that facilitate automatic control: once-through boilers, drainable superheaters, pressure firing and the tempering of air or gas entering superheaters during startup.

Qualified confidence was expressed in burner control systems based on eight years' experience and 33 installations, seven originated for computer control. Ross H. Forney, Forney Engineering Co, acknowledged however that some problems remain unsolved. But he said that results so far show that automatic burner controls may be used in most furnace designs burning all three major fuels. But since fully-reliable components are not yet available, he warned that individual flame supervising and burner control systems should *not* be connected to trip the boiler off the line. Each burner control should be independent of all others.

F. W. Lyle, speaking for Daystrom Inc, summarized computer control functions as three-fold:

1. To provide operators with more and better information on plant operation—scan and signal, give variable alarms, and log in data;

2. Perform sequencing operations, and

3. Supervise analog sub-loops of

FOR OUTSTANDING CONTRIBUTIONS to literature of thermal electric stations W. L. Cisler, ASME president (center), presents EEI Prime Movers Award to J. H. Harlow, Philadelphia Electric Co, and Sigmund Fiala, American Electric Power

the normal control systems.

Computer systems that carry out performance calculations were described by T. W. Jenkins and I. A. Kunzman of Leeds & Northrup Co. Such performance calculations are to be made at Bergen Station on two 290-Mw, units using steam at 2,350 psi, 1,100/1,050F for Public Service Electric & Gas Co. The computer will figure performance and provide hourly, weekly and monthly operating reports as well as operating guides in the form of deviations from bogie performance.

The concept of a computer as "an obedient idiot" that does only what it is told in operating generating equipment was stressed by Westinghouse Electric Corp's E. G. Noyes and J. D. Davidson. They warned that automatic stations will not be limited by the capacity of computer but by the limitations of the men who program its performance under normal and fault conditions.

At least two conference authors saw a lull ahead in steam cycle improvement, pending a breakthrough in high-temperature metallurgy. GE's P. H. Knowlton put the problem in these words:

"At present, advances in steam temperatures or pressures above the highest levels already reached or under consideration seem to cost more than they are worth in fuel saving. Thus there seems to be a roadblock on the path to high efficiency of the steam cycle. This situation prompts a look around for other paths to the goal . . ."

In his look around at big power cycle promising 40% thermal efficiency or better, he saw several that may top the target. They were: nuclear superheat, the mercury-steam cycle, steam alone, and a combination of steam and gas turbine cycles. Nevertheless, Knowlton still concluded that it will be a real challenge to continue progress above the 40% thermal efficiency mark.

Sharing Knowlton's dim view of present high temperature metallurgical progress, Robert A. Baker, Public Service E&G, saw present cost of austenitic steel too high to justify use in future unit designs. He regretted deviation from 1,100F steam, Baker said, but his company has decided to reduce design steam conditions for future new units to 3,500 psi, 1,000/1,000F. Baker said, however, that Public Service would resume use of austenitic

(*Continued on page* 92)

Dateline . . . Mexico City (*Continued from page* 5)

is under the nation's treasury department.

All three companies have their own unions. Mexlight's union, called Sindicato Mexicano de Electricistas (SME) headed by Luis Aguilar Palomino, is one of the most powerful in the country and has been attempting to form an "anti-block" union group to go against the unions that are dominated by leaders who have "intimate" government political connections.

It was the SME, under former leader Sanchez Delint, which was one of the sparks that touched off the big labor riots in 1958 when the government had to call out the troops. SME made a pact with the militant "telefonistas" or telephone workers union, to create a new and "independent" block away from the big group of labor federations allied with the PRI (Partido Revolucionario Institucional) which is the ruling party in Mexico.

In the electrical workers union (at the Mexlight company) magazine, "Lux," doubts were subtly expressed as to the possible future status under government tutelage. "As workers, we must declare with clarity that the change in ownership does not mean that our problems are automatically solved," says one worker in the August 31 issue of "Lux" in Mexico City.

"This is not going to be a 'sindicato blanco' (bought out) union like all the other unions of those who work for the government . . . this union will continue fighting; so this will not be another case such as our brother railroaders and petroleum workers (claiming they're beaten down by the government) . . . this same disgrace can be seen in other case where we have senators such as Fidel (Fidel Velasquez, head of big Mexican labor block which works closely with the ruling government party) and congressmen such as Perez Rios (who is said to be a millionaire and long time-government party man who was put as head of the government Federal Electric Commission workers).

All the electrical workers—members of the three big individual unions—will have a meeting in October to decide whether they can move together as one big union block. The Impulsura union workers and the Mexlight's SME workers have worked closely together in the past. Who will be the leader of the combined forces will present a problem. The government is extremely nervous about the fact that it's FEC workers will want raises putting them on a par with the newly acquired Mexlight and American & FP workers—this would "break the budget into pieces," said one government official.

The workers at Mexlight always had a hidden bargaining "ballbat" when negotiating with the company when it was in private hands—the threat of political pressure on the government to "nationalize." This was effective. Now, the company is nationalized, and the old bargaining weapon has dissolved. This union vs government, especially government promoted union leaders, fight will bear watching in the first shaky days of operation of Mexlight by the Mexican government.

KINSEY ROBINSON, Washington Water Power Co, addresses the executive session of NELPA. Others are (l to r): T. W. Delzell, T. E. Roach, J. H. Clawson, D. R. McClung, J. E. Corette, A. S. Cummins, all company presidents

NELPA Theme: Challenge of the 60's

Montana meeting hears federal hydro will continue growing, but utilities themselves will expand despite tight money

Proposals for federal hydro developments, camouflaged as irrigation improvements, will continue to confront Northwestern States investor-owned utilities throughout the 60's, the Northwest Electric Light & Power Association was told recently at East Glacier, Mont.

Regardless of the election's outcome, projects like those at Burns Creek and Garden Valley will continue to challenge utilities in the Northwest, according to T. E. Roach, Idaho Power Co. NELPA heard his paper read by M. M. Ilch.

Will Add 3,500 Mw

The regional companies, nevertheless, are preparing for vigorous growth in the new decade, having under construction at present four hydro projects, along with six more in various stages of advanced planning. Plans call for an addition of more than 3,500,000 kw, in capacity, some of it in six steam projects.

Roach declared that he had no doubt that all the economically feasible hydro potential remaining in the Northwest will be developed in the next ten years. Accordingly, thermal generation is rapidly assuming more importance in utility-company planning, and most companies are preparing for the day when power generation by nuclear reactors will be economically feasible.

"But our remaining hydro and future nuclear projects," he said, "will have to run a gamut of public-ownership opposition that could well make our battles of the past decade look tame. This election year already points up the impending dangers. One sign is the natural resources plank of the Democratic platform. But the Republican platform, although not advocating federalization of our industry, certainly lacks a forthright statement against further government encroachment."

Obtaining the funds for the tremendous growth ahead is, possibly, the biggest job facing the regional electric industry, said J. H. Clawson, Puget Sound Power & Light Co. Looking ahead over the next 11 years, he said, "we find that the electric companies plan to spend almost $52 billion for plant expansion. This is 20% more than the companies have accumulated in their plant accounts in the entire 77 years of the industry's experience."

Clawson estimated that retained earnings will provide $4.4 billion and depreciation accruals $16.6 billion, leaving some $31 billion to be obtained in the form of outside capital. He cited Ebasco Services' estimate of the way in which new capital requirements will be met: Long-term debt, $19.2 billion (62.1%), preferred stock, $3.56 billion (11.5%), and common stock $8.17 billion (26.4%), bringing the total to $30.93 billion.

Until a few years ago, utility common stocks were generally regarded as primarily income investments, he said. But more recently, increasing awareness of the growth factor in the electric industry has developed, and today the popular stocks are those of companies which have demonstrated a consistent ability to show an increase in share earnings.

6% Return Not Enough

"This means," Clawson declared, "that an adequate rate of return on total capital must be allowed by regulatory commissions —one that takes fully into consideration the present and the future high cost of senior money. A 6% rate of return is no longer adequate with bond money costing 5% and preferred stock money 5 to 6%.

"I submit that there is no conflict of interest between our customers, the rate payers, and the investors," he continued. "On the contrary, adequate earnings which allow us to attract new capital on a favorable basis are essential in order that we may best serve our customers at lowest possible cost."

But today's inflationary forces imperil the ability of regional utilities to provide electricity at a unit cost lower than the pre-war cost to the consumer, said Don R. McClung, Pacific Power & Light Co. Hence, there is today, he said, in-

dustry-wide recognition of the urgency to offset inflationary costs with economies in operation and construction.

"We can no longer depend on technical advances to maintain a balance between operating expenses and revenues and assure a fair rate of return on the investment," McClung declared. "Cost of capital alone is grounds for very real concern. It is discouraging that so few regulatory authorities are realistic in appraising the effect of inflation on this component of cost. Recent rulings by some regulatory agencies have mistakenly assumed that the utility industry can expect to attract capital in the future at interest rates comparable to the averages over long periods of the past."

The speaker cited the serious need for research into the curtailment of costs, with special attention to automatic substations, labor-saving tools, and especially the application of computers for repetitive computations.

Gas Gives Challenge

Natural gas poses a new and growing challenge to utilities in the Northwest, where electricity for a long while was the basic energy supply, declared T. W. Delzell, Portland General Electric Co.

"Our remarkable position," he said, "is due in large degree to geography and human behavior, neither of which is controllable by our sales departments. The need for an aggressive sales and promotion program will be more acute in the future."

Although his company has not actively promoted electric space heating, Delzell pointed out, it now has 33,000 electrically heated homes on its lines. Thus electric heating is the second largest consumer of energy, he said, even though it is only in 14% of the homes.

"Our rate and research department," he said, "has prepared load forecasts indicating that the average annual consumption by residential consumers will reach 16,000 kwhr by 1975, in contrast to the predicted national average of 9,400 kwhr. Of this amount, 6,200 kwhr will be provided by electric heat which, according to our forecast, will reach a saturation of 48%.

"I do not propose" he continued, "that electric heat be marketed on any basis remotely resembling a non-compensatory promotional rate. It is my firm opinion that this kind of subsidy is totally unnecessary." Delzell urged a better regional selling job to attract industry of the Pacific Northwest. The accumulative effect would result in commercial and industrial expansion and, along with these, increased home building and expansion in residential use of electricity.

"Our high levels of use make maintenance of a continuing rate of growth more difficult, but it can be achieved if we approach the problem with vigor and a sense of our responsibility to the community and the states in which we live," he concluded.

The meeting heard A. S. Cummins, California Oregon Power Co, define investor relations as the application of common sense and sales techniques to groups of people who have what the industry needs—money. Such stockholders, he said, should be informed of company conditions by the company president himself, and annual meetings should be rotated from area to area to give all a chance to attend.

Meeting Hears Corette

J. E. Corette, Montana Power Co, gave the following as the essentials of good employee relations:

1. Sincere interest of the supervisor in the welfare of his people

2. Good wages and working conditions

3. Efficient working organization with the right number of people of good quality

4. Employees of quality, people of honesty, integrity, decency and capability in their particular work

5. Efficient planning and supervision, so that everyone can be proud of his department

6. Opportunity and training to improve and advance.

"You do not have to grant in a labor contract any featherbedding practices," he said. "It is not beneficial to the employee. It destroys morale. It is expensive and detrimental to the customer as well as to the stockholders.

"We do not have to retain an employee who is inefficient, incompetent, disloyal, or uncooperative. You may improve relations more by getting rid of him than by keeping him on. You don't have to be easy about expecting a full day's work or high efficiency."

Each chief executive should make public relations a major consideration in everyday operations, said K. M. Robinson, Washington Water Power Co. The public relations job is bigger than any one department, though responsibility for plans and coordination may be centered in people specialized in the field.

"Public relations," he said, "involves everything we stand for, everything we print and say, and everything we do. No department is exempt from responsibility. If a customer thinks service is not cheap, our job is to convince him that he gets value for his money, and it helps some if customers like you from the start."

Following the utility executives' speeches came a lively, free-for-all question-and-answer period moderated by C. F. Hochgesang, editor of *Electrical World*:

Questions Answered

"How do you reconcile Priest Rapids' type agreements (whereby investor-owned utilities essentially finance the PUD project by contracting for most of the power) with the private enterprise system?"

Robinson (WWP): "Any company in its right mind would never build a power plant in the State of Washington because it could be condemned by PUD's before it got the first kilowatt-hour out. Since the private companies couldn't build a plant on the Columbia River, it was either the PUD's or the federal government. It's been a great disappointment to the real honest-to-God public power advocates that the private company went in there and financed its portion, in most cases all of it, and we get that power for 50 years. We sure pushed the federal government out another notch, which I am all in favor of."

"What should be the attitude of management with respect to participation as citizens by company employees in things political?"

Corette (MPC): "Our company believes, and I think this should apply to all American business, that political participation is an essential element of good citizenship and political participation should be encouraged."

"What do you perceive for the Northwest power picture should the

Democrats win the presidency—does this mean a chance for the Columbia River Power Corp?"

Delzell (PGE): "As a lifelong registered Democrat who has been voting Republican for the last 24 years, I think it would tend to enhance the possibility that it will be enacted. It would enhance all manner of bigger and better federal planning, federal expenditures."

"Kinsey, will you please give us a progress report on the prospect at this stage for Pacific Northwest Power Co development of Mountain Sheep (hydro project)."

Robinson (WWP): "It is going to be very difficult to get a license for High Mountain Sheep. I think we have a well prepared case and I think that we have a better than 50-50 chance. We have support from the state fish and game people and federal fish and game, sports organizations and labor. I have great hopes and I am sure that the other three members of our group feel the same way."

"Do all the members of the panel agree that electric house heating is desirable, and if not, why not?"

Ilch (IPC): "In Idaho, we have a peak run in the summer months because of irrigation use that permits a range of available energy in winter months that can be filled in very neatly by house heating load. We are carefully approaching the problem as we do not want to exceed the peak."

Give Views on Heating

Cummins (COP): "We do encourage it, we have for quite some years. We have no special rate, we simply use our present residential rate. Of course, any electric heating customer is down in the low block anyway. At the moment 23% of our residential customers are full space heating customers. Of all the houses built during August about 65% were going electric heat."

Clawson (PSP&L): "We are after house heating and we find our customers want it. Incidentally, we have a new development called Summerset which is going to be a total electric community."

"Rate engineers have the unenviable reputation of fighting electrical loads which have proceeded to develop into profitable ventures. How do you account for this attitude?"

Robinson (WWP): "Well, I think you can take figures and prove that we lose money on every schedule we have. We did take monthly readings on 250 house heating customers before we actually promoted house heating and the cost of over 250 houses averaged 16.5¢ a sq ft for the annual heating cost. We found that if the customer put in heating capacity somewhat in excess of the spare requirements and a thermostat in every room, the peak was not too serious for us, even though we are in an area with 6,900 degree-day deficiency."

"Assuming we get the depression that was mentioned as a possibility by Mr Soher, can private utilities survive it?"

Ilch (IPC): "All of us survived the last depression, if that is any aid to our thinking. Because this area is largely in the hydro-development type of plant our costs are not likely to go up in relationship to other costs. Utilities in the Northwest are in the best position to survive another depression."

Can Outride Recessions

Corrette (MPC): "The 1954 and 1958 recessions clearly indicated that the electric industry was the most sound of any industry in America against recession. In 1958 there was only a slight drop in residential and commercial business and the total electricity produced throughout the US was approximately the same as the previous year. The industry makes enormous contributions to the economy in the year of recession, which helps reduce the extent of the recession. This was evidenced in 1958, when the expenditures for plant and equipment by the electric utility industry were about 11 or 12% of the total expenditures for plant and equipment of all business.

"Generally speaking, corporate mergers and acquisitions among power companies might provide another path for savings. In the future, will it be necessary for the private utilities in the Pacific Northwest to merge into a single company to accomplish better their objectives in the next decade? We have two things here—the possibility of a corporate merger as against retaining two separate corporate structures, and completely merging operating structures or systems."

Cummins (COP): "I am a strong believer that large amounts of capital generally can do bigger jobs than smaller isolated amounts. As a political expedient in the Northwest area, private enterprise might be safer if all companies in the area were merged."

McClung (PP&L): "It has been our experience that there have been tremendous savings with some mergings. We think that there should be more mergers between smaller companies if we may survive in the Northwest—I mean against the attacks of public ownership."

Makes Predictions

Prosperity can be attained during the Sixties, but there is great need for economic literacy and moral discipline, said H. J. Soher, financial consultant. He predicted:

1. Good jobs will be available to the increased work force to provide the long anticipated stimulant to our economy, if we can control our costs as do nations with which we compete in the world market.

2. We can sell our goods to foreign nations at competitive prices, if our prices remain constant or are reduced.

3. We can maintain our leadership in scientific, technological and mass production activities, but our greatest danger is complacency. We can lose our position if unions obstruct progress through featherbedding or other restrictive policies.

4. A free enterprise economy can most certainly compete with Communist slavery in the world market. Japan and Hong Kong, the Common Market nations, and Great Britain have demonstrated their ability to do so.

In the US, these forces will be pushing power policy toward greater federal participation during the Sixties, said Arthur Barnett, National Association of Electric Companies.

1. Growth of the idea that the federal government should provide more of the basic needs and services of the people.

2. Pressures on political parties to prove that each is doing more for the people than the other.

3. The argument that increased federal spending will contribute to the national rate of growth and help us stay ahead of Russia.

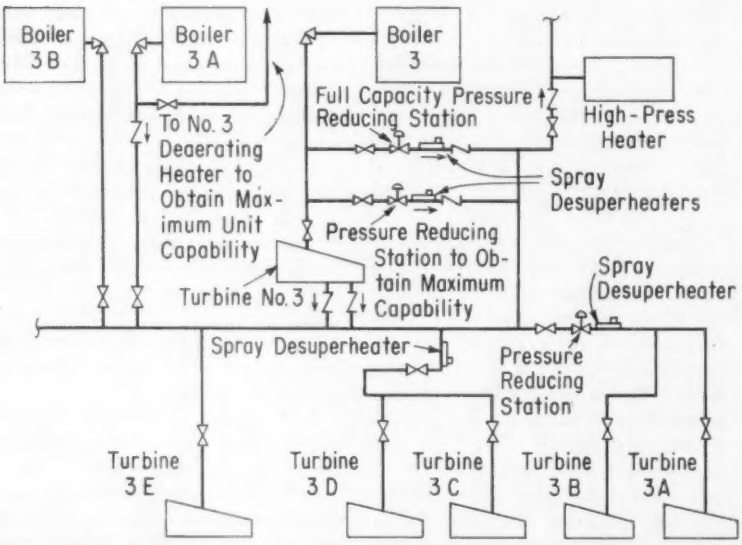
(*Continued on page* 90)

Topping Unit Adds Capacity, Improves

40.5-Mw, 1,525-psig, 1,000F unit topping five 250-psig units meets Tulsa Station's new load and replacement needs

MERL J. LINDBURG, Maintenance Supervisor, Public Service Co of Oklahoma, Tulsa, Okla.

TULSA POWER STATION meets growing system load needs by constructing the outdoor boiler at left. The installation met station's obsolescence problem



COMPOUND UNIT comprises new 40.5-Mw, 1,525-psig unit and five older 250-psig units. Topping unit cut heat rate from 18,000 to 12,000 Btu per kwhr

Installation of a 40.5-Mw topping unit gave Public Service Co of Oklahoma capacity for meeting load growth along with capacity for replacing low-pressure turbine-generator units nearing obsolescence. Thus the topping unit not only provides capacity to meet load growth requirements, but has modernized the five 250-psig units at Tulsa Station.

With it, the station supplies a total of 110 Mw at a heat rate of 12,000 instead of the old 18,000 Btu per kwhr. Remote controls, installed on three boilers, permit a reduction of three operators per shift. Heaters, pumps, piping, and the building itself were renovated to insure reliable operation and minimum maintenance, and eight boilers were retired.

Fits System Operation

The compound unit's flexibility fits well into system operation. Maintenance of the low-pressure turbo-generators can be handled without loss of the unit's entire 110-Mw capability. The heat rate does not change from 40 to 100 Mw. Economical loading of the system generation dictates that those portions of the unit required for system capacity normally operate at full load.

A study indicated that the 40.5-Mw, 1,525-psig, 1,000F, non-condensing turbine, exhausting to five 250-psig condensing turbines, would bring maximum overall economy. An alternate plan for the installation of a 100-Mw, 1,450-psig, 1,000F condensing unit at a new site was compared to determine overall costs.

Non-condensing units of 27 and 54-Mw capacity were considered. As a 27-Mw unit would not give enough steam to operate the five 250-psig turbines, and its installation cost per kw would be high, this study did not reach into detail. As the 54-Mw unit would need more steam than the existing turbines could use, it was discarded because of the increased cost of unusable capacity. The 40.5-Mw turbine, with

two existing boilers, affords the greatest plant capability.

The 250-psig plan has ten boilers and five turbo-generator units with a capacity of 70 Mw. As portions of the plant were built in the 1920's, maintenance and operation costs were relatively high. All boilers burn natural gas, some burn fuel oil, and some others stoker coal as an alternate fuel.

With the non-condensing unit, capacity could be increased 57%, and the heat rate reduced 33%. The study indicated that after 15 years there would be a 1.2% cut in all costs, compared with the results of installing a 100-Mw unit. Among costs considered were those for operating and maintaining, and investment.

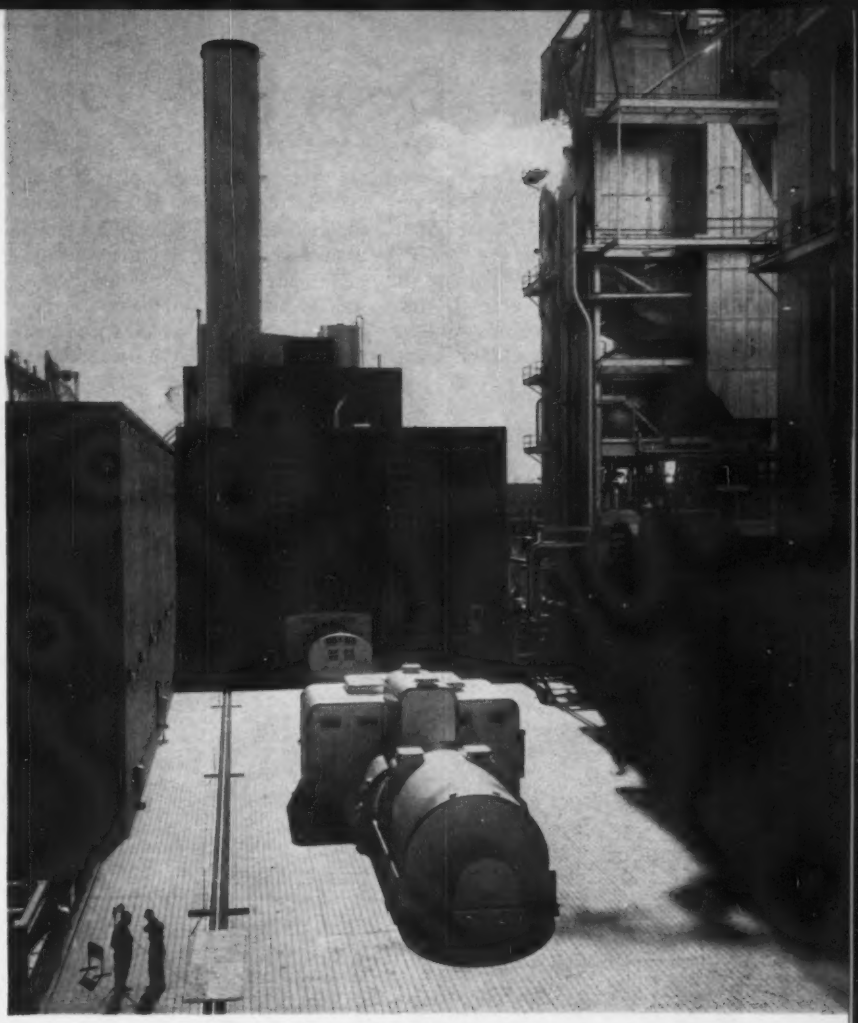
The useful life of the existing units was extended and they are now more economical to operate. Additional savings in retirement charges came from not installing replacement capacity.

Control Room Built

The feedwater heater in the new unit uses steam from the high-pressure turbine exhaust and is cut out of service, when necessary, to provide maximum unit capability. The heat rate is reduced 8.8% at maximum capacity with the heater in service. A back-pressure regulator automatically changes loads on the high-pressure turbo-generator as loads on the 250-psig turbo-generators are changed.

Location and size of the existing control room prompted the building of a new one. Six boilers, two new reheat units, and the high-pressure turbo-generator of the compound unit are controlled from the new control room. The loading of the five 250-psig turbines and one 700-psig turbine are controlled from the older one. There is excellent communication between the two control rooms.

To minimize personnel without jeopardizing service continuity, a data logger, printing annunciators, and a 100-point scanner-recorder were installed with the compound unit. The data logger in the older control room takes hourly readings on seven turbines and scans for off-normal conditions of selected items, such as bearing and generator temperatures and loss of pumps.



TOPPING UNIT is on outdoor deck. It discharges to five 250-psig units in the building to left. The area it occupies was formerly an enclosed boiler room

One printing annunciator is with the data logger for printing sequential operation of alarms. Additional alarms requiring immediate operator attention are lighted on window-type annunciators. The printing annunciator and data logger permit the plant supervisory personnel to determine what is not normal each day and in a generator trip-off or other outage determine which occurred first. An additional printing annunciator was installed in the new control room with the boiler controls.

A 100-point scanner-recorder has 20 points assigned to measuring the compound-unit boiler temperatures during startups. The scanner also measures bearing temperatures on the high-pressure turbine and boiler auxiliary equipment associated with the compound-unit boiler and three older boilers.

Operation of the compound unit has presented few problems. The major difficulty has been erosion of the desuperheating spray-water control valve internals which control the steam temperature to units 3C and 3D (see drawing). This erosion is caused by the reduction of pressure from 2,000 to 270 psig at relatively low flows.

The two 170-Mw reheat units were designed subsequent to the engineering of the compound unit and operate individually. The 700-psig plant is a 33-Mw-capacity unit of the one-boiler, turbo-generator type and was installed in 1947. This 700-psig plant also operates individually.

Does Inflation Call for Earlier

FRANCIS J. VOJTA, Planning Engineer, Northern States Power Co, Minneapolis, Minn.

An almost constant increase in prices since World War II has prompted critical analysis of the consideration that should be given to this inflationary spiral by the system planner in making recommendations for the most economical plan of system development. A study of the effects of price changes, with special attention to the effect of a time interval between expenditures on alternate plans, does not support the idea of early investment to avoid higher costs later.

In a runaway type of inflation, prices, monetary requirements, cost of living, wages, and cost of production chase each other in an increasing spiral in which a state of equilibrium at a higher level is not reached and the inbalance increases. Germany in 1923 was an example of runaway inflation. Employers adjusted wage rates almost daily to changes in the cost of living index. As soon as workers were paid they rushed to stores to make purchases before the purchasing power of their money decreased.

Runaway type inflation is not considered here because:

1. It has no precedent in United States history.

2. It appears that our stable form of government and well established system of monetary and credit controls will prevent this type of inflation.

Fig 1-Wholesale Prices in the US

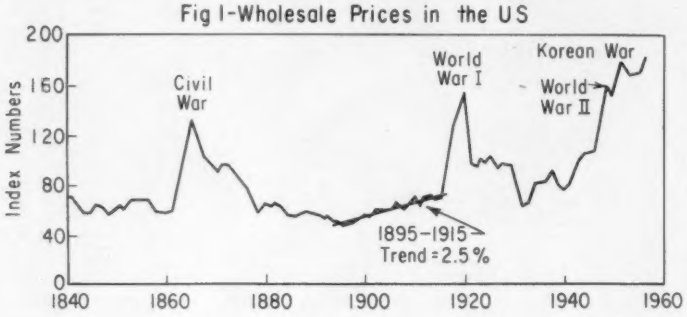


Fig 2-Wholesale Prices in the US

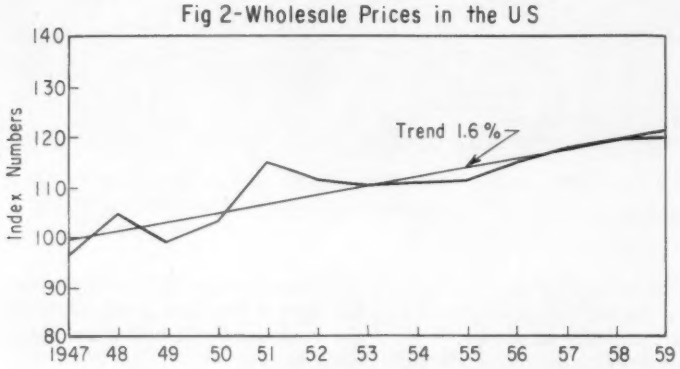
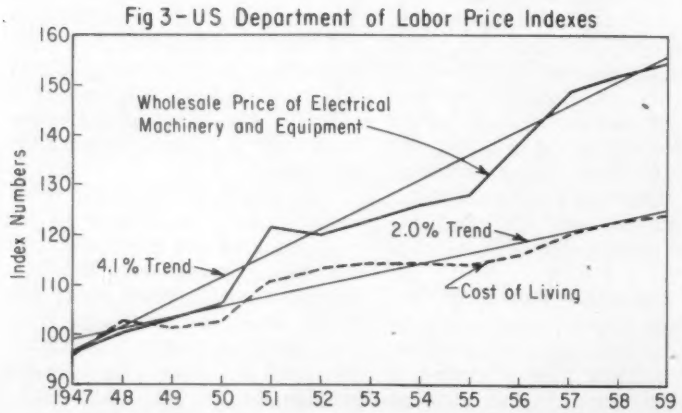


Fig 3-US Department of Labor Price Indexes



Wholesale Index Best

The best long-range gauge of inflation in this country is the wholesale-price index, Fig 1, which has been recorded by federal agencies. The more familiar period of price increases, 1947-1959, shown in Fig 2, is on the base, 1947-1949 average equals 100. The curves show that financing a war results in a sharp inflationary trend. They also show that times of prosperity have an inflationary trend, and it is to this type of inflation that the system planner's attention is directed.

The problem to be considered illustrates the effects of inflation in making an economic comparison. The problem is simplified to facilitate the illustration. It concerns a transmission line which has ceased to meet the required standards of performance. The selection of alternate plans has been narrowed down to the two plans shown in Table 1.

Plan A provides for an immediate expenditure of $30,000, which will extend the life of the transmission line for five years, when a complete rebuild is necessary. The cost of the rebuild is $100,000, the salvage value of the old line is equal to the removal cost. Plan B provides for the immediate rebuild of the line.

Investments?

The expenditure is $100,000 and again the removal cost of the old line is equal to the salvage value. The comparison of Table 1 indicates Plan A is the economic choice by a wide margin.

Table 2 shows the effect on Plan A when a 5% annual price increase is considered. The comparison in Table 2 indicates Plan B as the economic choice. Thus, when "inflation" is considered, the economic comparison results in an entirely different answer.

One of these solutions is correct. The error occurs in Table 2, where inflation is considered in pricing future expenditures while no consideration is given to the effect of inflation on the current expenditure.

During periods of price inflation the replacement cost of installed plant increases. This results in an increase in the market value of installed plant. This increase must be expressed in the price of capital stock, which ordinarily represents 40-50% of the installed plant valuation. Thus, stock price should increase at a greater rate than the price inflation.

Use Is Limited

Price increases of electrical machinery and equipment are shown in Fig 3. An annual increase of 4.1% is indicated. The use of this index has limitations, because the equipment that utilities use is not represented in the proportion of utility requirements and the index indicates only price without giving consideration to product improvement. However, it does serve as a rough guide to price inflation as experienced by electric utilities.

The investor expects his equity investments to protect him against monetary depreciation. Therefore, the market value of electric utility stocks must increase during periods of monetary deflation in order to attract equity capital. In order to do this, it is necessary to increase earnings during inflationary periods.

Revenue requirements and prices are both increased 5% annually in Table 3. The interest on debt and depreciation components of the revenue requirements would remain

(*Continued on page* 90)

Table 1—Comparison of Plans A and B Without Price Increases

Year	Plan A Total Investment	Plan A Revenue Requirement at 15%	Plan B Total Investment	Plan B Revenue Requirement at 15%
1	$30,000	$4,500	$100,000	$15,000
2	30,000	4,500	100,000	15,000
3	30,000	4,500	100,000	15,000
4	30,000	4,500	100,000	15,000
5	30,000	*30,000	100,000	15,000
6	100,000	15,000	100,000	15,000

Year	Present Worth Factor	Present Worth of Revenue Requirements Plan A	Plan B
1	0.9434	$4,245	$14,151
2	0.8900	4,005	13,350
3	0.8396	3,778	12,594
4	0.7921	3,564	11,882
5	0.7473	22,419	11,210
6 to infinity	0.7050 × 16.6667	176,250	176,250
		$214,261	$239,437

The advantage of plan A over plan B is $\frac{239,437 - 214,261}{214,261} \times 100 = 11.8\%$

*This figure includes $4,500 revenue requirement on the $30,000 for year 5, plus $25,500, the undepreciated part of the $30,000. In both plans, removal costs were considered equal to salvage value.

Table 2—Plan A With a 5% Annual Price Increase

Year	Investment	Revenue Requirement at 15%	Present Worth Factor	Present Worth of Revenue Requirements
1	$30,000	$4,500	0.9434	$4,245
2	30,000	4,500	0.8900	4,005
3	30,000	4,500	0.8396	3,778
4	30,000	4,500	0.7921	3,564
5	30,000	*30,000	0.7473	22,419
6	121,550	18,200	0.7050 × 16.6667	213,850
				$251,861

The advantages of plan B over plan A with a 5% price increase is

$$\frac{251,861 - 239,437}{239,437} \times 100 = 5.2\%$$

*Same as Table 1.

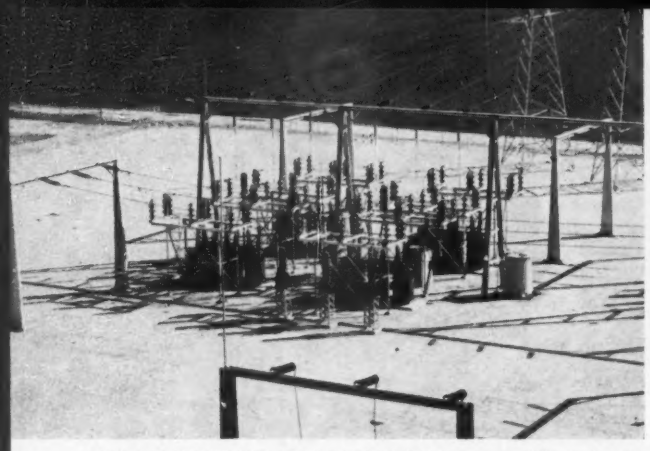
Table 3—Comparison of Plans A and B With a 5% Annual Price Increase and a 5% Annual Increase in Revenue Requirements

Year	Fixed Charge in %	Plan A Total Investment	Plan A Revenue Requirement	Plan B Total Investment	Plan B Revenue Requirement
1	15.75	$30,000	$4,725	$100,000	$15,750
2	16.54	30,000	4,962	100,000	16,540
3	17.36	30,000	5,208	100,000	17,360
4	18.23	30,000	5,469	100,000	18,230
5	19.14	30,000	*31,242	100,000	19,140
6	15.75	121,500	19,144	100,000	20,100

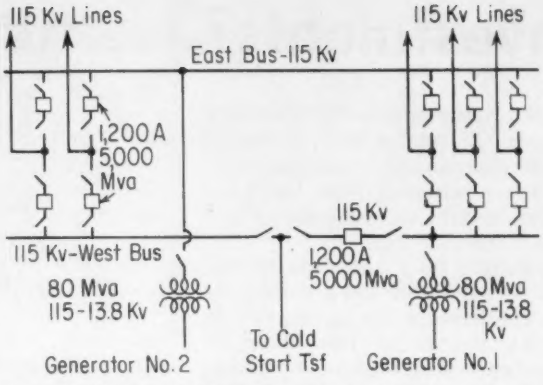
Year	Present Worth Factor	Present Worth of Revenue Requirements Plan A	Plan B
1	0.9434	$4,458	$14,859
2	0.8900	4,416	14,721
3	0.8396	4,635	15,450
4	0.7921	4,332	14,440
5	0.7473	23,347	14,303
6 to infinity	0.7050 × 105	1,417,135	1,487,906
		1,458,323	1,561,679

The advantage of plan A over plan B is $\frac{1,561,679 - 1,458,323}{1,458,323} \times 100 = 7.1\%$

*This figure includes $5,742 revenue requirement for year 5, plus $25,500, the undepreciated part of the $30,000. In both plans, removal costs were considered equal to salvage value.



SAN BERNADINO STEAM STATION has modified double bus-double breaker and ring bus scheme, seen here



THE BUS AND FOUR BREAKERS associated with two 115-kv transmission lines are, as diagrammed, apparent in photo

Layout Facilitates Insulator Cleaning

Modified double bus-double breaker and ring bus scheme solves contamination problem at steam plant substation

S. H. GOLD, Electrical Engineer, California Electric Power Co, San Bernadino, Calif.

A modified double bus-double breaker and ring bus scheme at California Electric Power Co's San Bernadino Steam Plant simplifies insulator cleaning. This scheme was adopted after investigation stimulated by the cleaning difficulties at a nearby plant which has a main and transfer bus arrangement.

Needs Regular Washing

San Bernardino Plant is east of Los Angeles in an area where insulator contamination demands periodic washing. Each of its two 62.5-Mw units represents about 20% of system peak, and spinning reserve normally is provided for only one unit. Accordingly, the plant's 115-kv bus arrangement was carefully planned to limit forced interruptions of one machine.

The modified arrangement, costing no more than a conventional double bus, has many desirable features of the double bus-double breaker and the ring bus, such as:

1. Insulator washing and oil circuit breaker maintenance are accomplished without compromising protection. Only one section of the bus is cleared at any time.

2. Minimum switching clears oil circuit breakers for maintenance.

3. No by-pass switches are needed.

4. Bus differential is simple.

5. A generator need not be taken off the line when a 115-kv generator oil circuit breaker is serviced.

6. Loss of generation to the system due to a bus fault is limited to that of one unit even when the ultimate capacity of four units at the station is reached.

The bus consists of 1,272-MCM aluminum conductor on suspension. The bus structure has tapered end supports spaced at 35 ft, fabricated from 24-in. wide flange shapes cut on the diagonal. The ends were reversed and two halves welded together. The cross-section increases as the moment increases, providing a maximum section at the base. A composite girder, consisting of a wide flange shape and a channel, spans the end supports.

Bus sections are protected by bushing-type linear couplers on each breaker. Bushing linear couplers on the main power transformer complete the circuit and permit the opening of any breakers or removal of the main power transformer without loss of bus differential protection.

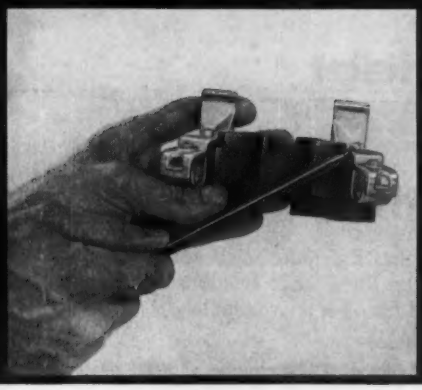
The long lines are protected by directional distance phase relays and directional overcurrent ground relays. Two short lines (5 miles) are protected by phase comparison relays using 2100-MC band microwave. Backup is provided by directional distance phase relays and directional overcurrent ground relays. High speed (20-cycle) automatic reclosing is provided on the two short lines.

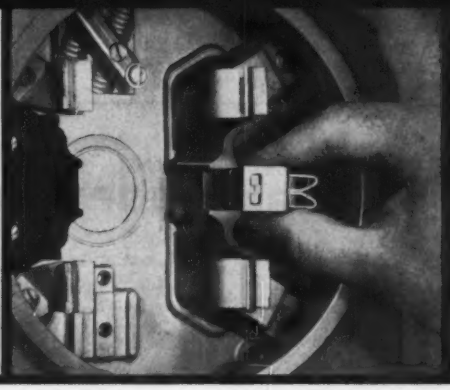
One problem in the design of the bus arrangement was insuring proper currents and bus voltage to the relays during a fault. Some transmission lines are wood-pole construction, and faults involving more than one phase are not uncommon. It is essential therefore that voltage be applied to the relays before the breaker is closed for the directional features of the relays to function properly.

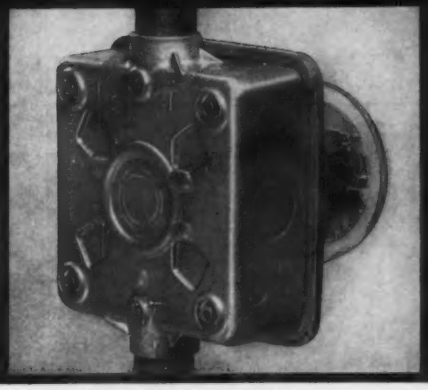
Not Paralleled

The secondaries of the bus potential transformers are not paralleled. An automatic bus potential selector scheme provides correct voltages to the relays by using breaker pallets and the XY closing sequence. Voltage is applied to the relays before the main breaker contacts close to assure proper relaying, should a breaker be reclosed into a close-in fault.

The modified double bus-double breaker and ring bus arrangement at San Bernardino Steam Plant, in service for three years, has proved to be satisfactory. The same basic bus arrangement is to be used at Calectric's new Cool Water Steam Plant, now under construction.







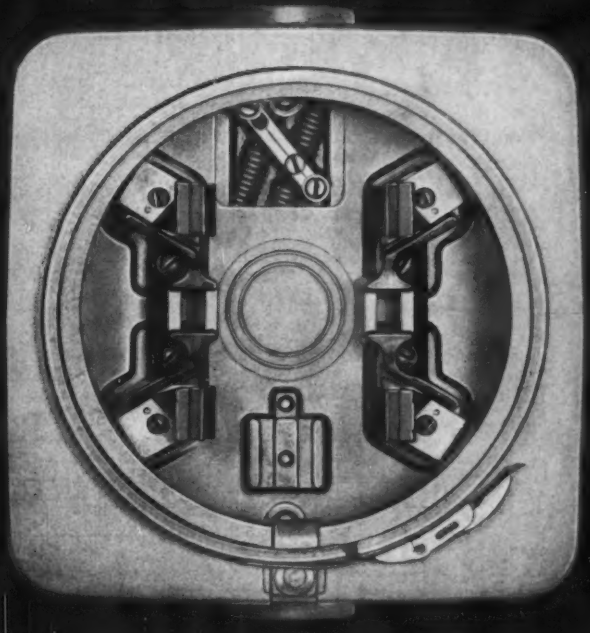
NEW S-2 TERMINAL BLOCK ASSEMBLY—with exclusive one-piece combination jaw and connector strap—permits an unbroken current path from meter blades to line wires for excellent electrical conductivity, low heat rise, for added reliability.

NEW PLUG-IN TERMINAL, another General Electric S-2 exclusive, installs in seconds—without tools, and without removing any part of the meter socket . . . greatly simplifying shop or field conversion to five or six terminal sockets.

EXCLUSIVE SQUARE DIE-CAST ALUMINUM CASE—with baked-on all-weather finish — gives maximum strength, corrosion protection . . . provides full raintight construction . . . unitized hubs. And, modern styling eliminates sharp, hazardous corners.

General Electric Announces . . .

NEW S-2 SQUARE METER SOCKET



General Electric S-2 sockets—for all 100-amp services—offer two **exclusive** new features providing greater reliability, increased versatility.

GREATER RELIABILITY is provided by unique one-piece combination jaw and connector strap—permitting an unbroken current path from meter blade to line or load wires with minimum heat rise.

INCREASED VERSATILITY results from the only true plug-in terminal on the market today . . . installs in seconds—without tools—for easy conversion to five or six terminal socket.

PLUS 6 EXTRA VALUE FEATURES

1. **Largest wiring space** of any die-cast socket—144 cubic inches—permits fast, easy wiring.
2. **Die-cast aluminum case**—plus baked-on finish—protects against corrosion and weather.
3. **Lay-in wire connectors** accommodate both aluminum and copper wire.
4. **Positive one-way knockouts** provide a perfect knockout every time . . . eliminate prying or bending.
5. **Choice of neutral connectors**—two channel or single lay-in neutral connector.
6. **Unitized hubs** are cast as part of case . . . no extra charge for second hub at bottom.

NOW AVAILABLE. *Contact your G-E Sales Office or Authorized Distributor for full S-2 information. Or, write General Electric Company, Somersworth, N. H.* 711-01

METER DEPARTMENT

GENERAL ELECTRIC

Determine Economical Feeder Conductor Sizes

R. A. DEWBERRY, Electrical Engineer, Montana-Dakota Utilities Co, Minneapolis, Minn.

In evaluating the relative economics of different conductor sizes on feeders it is necessary to weigh the difference in cost of losses against the added investment cost of the larger conductor.

The annual losses on a uniformly loaded distribution feeder are given by the formula,

$$P_1 = \text{Loss Factor} \times 8{,}760 \left(\frac{\text{kva}^2 r_1 d}{3\text{kv}^2} \right) \times 10^{-3} \text{ kwhr/year} \quad (1)$$

where r_1 = resistance per conductor per mile
d = length of feeder in miles.

If the conductors are enlarged to ones having a resistance of r_2 ohms per conductor mile, the annual power loss is,

$$P_2 = \text{Loss Factor} \times 8{,}760 \left(\frac{\text{kva}^2 r_2 d}{3\text{kv}^2} \right) \times 10^{-3} \text{ kwhr/year} \quad (2)$$

and the savings brought about by the larger conductors are,

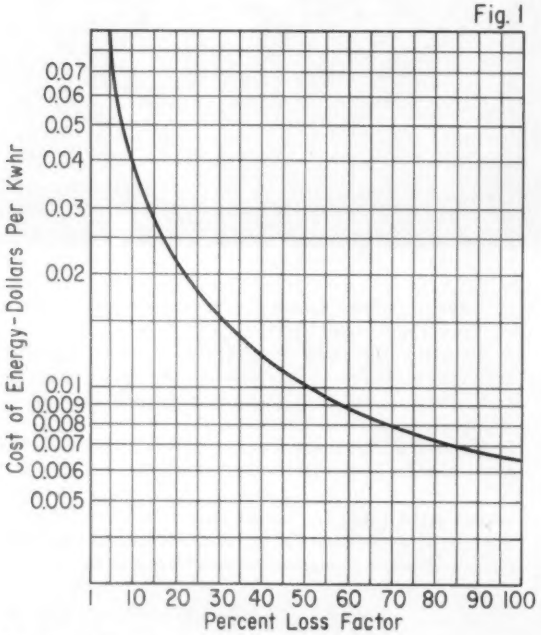
$$P_1 - P_2 = \text{Loss Factor} \times 8.76 \left(\frac{\text{kva}^2 d(r_1 - r_2)}{3\text{kv}^2} \right) \text{kwhr/year} \quad (3)$$

In dollars saved per year this is,

$$C_s = \text{Loss Factor} \times 8.76 \left(\frac{\text{kva}^2 d c_1 (r_1 - r_2)}{3\text{kv}^2} \right) \$/\text{year} \quad (4)$$

where c_1 is the cost of electric energy per kwhr.

Fig. 1



From General Electric Distribution Data Book.

In equation **(4)**, c_1 has a definite relationship to the loss factor as shown by Fig 1. The relationship of the loss factor to the load factor is approximately:

$$\text{Loss Factor} = \text{Load Factor}^{1.6} \quad (5)$$

Therefore the loss factor $\times$ c_1 can be plotted as a function of load factor as shown in Fig 2. With this in mind equation **(4)** can be written as

$$C_s = \text{LF}^{1.6} c_1 8.76 \left(\frac{\text{kva}^2 d(r_1 - r_2)}{3\text{kv}^2} \right) \$/\text{year} \quad (4')$$

where LF = Load Factor. Equation **(4')** is approximately correct for load factors between 0.3 and 0.8 which covers the range for most cases.

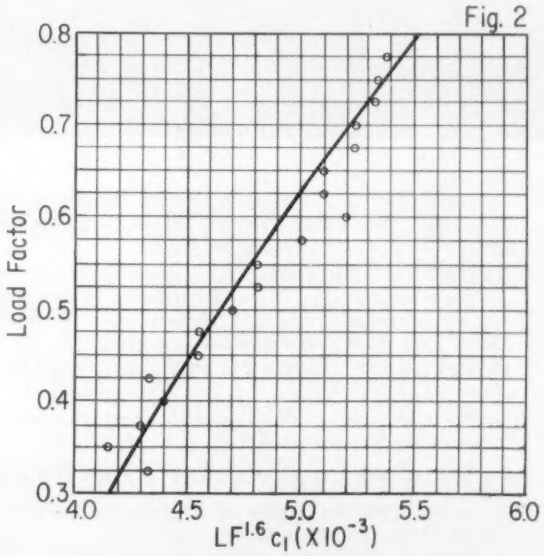
Equation **(4')** is evaluated by the charts which show the monetary value of changing to larger conductors.

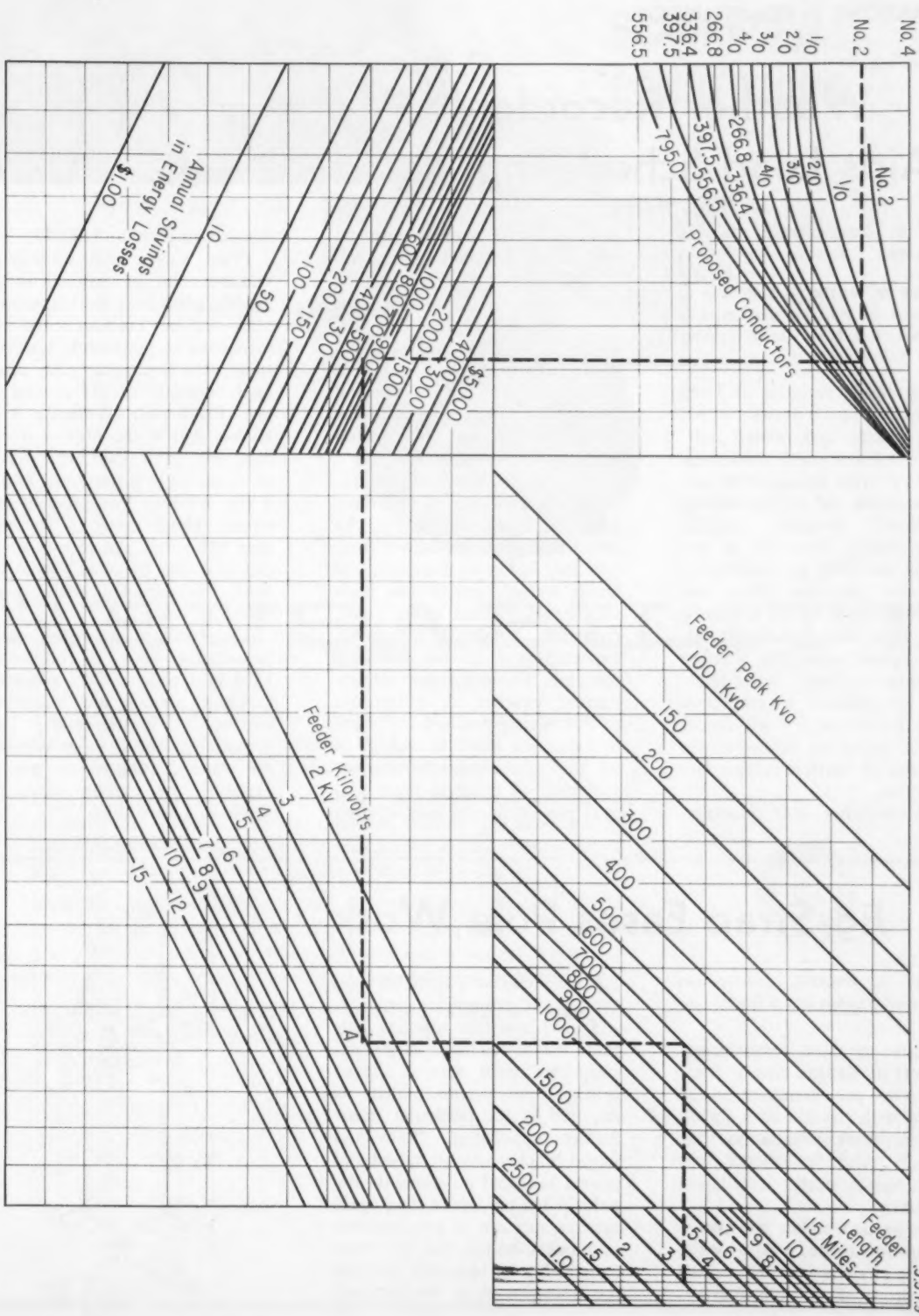
Example

A 4,160-v feeder, uniformly loaded, is three miles long and carries a peak load of 600 kva at 90% pf and a 50% load factor. Assuming the existing conductors are No. 2 ACSR, what would be the annual savings in energy losses if the conductors are changed to 3/0 ACSR?

Enter chart in upper right at load factor = 0.5, come down to feeder length, 3 miles, extend to left to 600 kva and drop vertically to 4.16 kv (Point A). Then enter chart at upper left at No. 2 ACSR and extend to right to proposed 3/0 conductor curve. From here drop vertically to intersect the horizontal projection of Point A and read $700. This is the value of equation **(4')** for the assumed conditions and represents the annual savings in energy losses brought about by the larger conductors.

Fig. 2




No. 4
No. 2
1/0
2/0
3/0
4/0
266.8
336.4
397.5
556.5
795.0
Proposed Conductors
No. 2
1/0
2/0
3/0
4/0
266.8
336.4
397.5
556.5
795.0
$5000
4000
3000
2000
1500
1000
900
800
700
600
500
400
300
200
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50
10
$.00
Annual Savings in Energy Losses
Feeder Kilovolts 2 Kv
3
4
5
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7
8
9
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12
15
A
Feeder Peak Kva
100 Kva
150
200
300
400
500
600
700
800
900
1000
1500
2000
2500
Feeder Length
15 Miles
10
9
8
7
6
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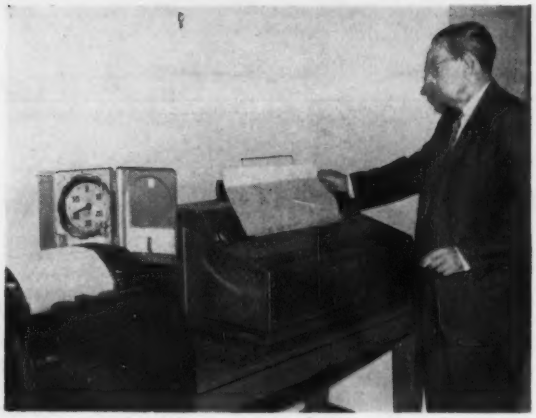
3
2
1.5
1.0
Load Factor .3 .5 .7 .9
Enter Chart Here

Fig. 3



Weather Recorder Aids Load Scheduling

JOHN R. GUMMERSALL, Division Manager, Systems Operations Dept;
GEORGE W. MILLIKEN, Staff Asst in Charge of Weather and Loading Forecasting, Long Island Lighting Co, Hicksville, N. Y.

A facsimile recorder at Long Island Lighting Co draws weather maps, charts, and related data, unattended and on a continuous basis to provide management with an invaluable aid in determining tomorrow's demand requirements, today. The unit is extremely valuable for scheduling generation outages. Also, for scheduling work on the transmission system where scheduled outages depend upon the weather conditions — and accordingly must be planned several days ahead. Furthermore it will be extremely useful in following the approach of hurricanes and major storms.

The Weather Fax recorder, developed and manufactured by the Times Facsimile Corp, receives its input over a telephone line in a manner similar to that of a teletype. The original weather data are made available to LILCO, as well as to other utilities, by the US Air Force and the Aviation Authority with the permission of the Washington office of the Weather Bureau.

The recorder produces two different maps, one every three hours on a rotating basis. The detailed, national weather forecast map indicates movements of fronts and of high or low pressure areas, "cloud cover," precipitation, humidity, etc, to be expected at 8 am the following morning. The other map depicts current weather as a function of barometric pressure corrected to mean sea level, as well as of all the other standard weather variables. A program timer permits preselection of only weather data of interest to LILCO.

From these, and additional seasonal and operational intelligence, plant peak loading schedules can be predetermined by management personnel. For instance, the September daily peak load normally occurs around 8 pm. From past experience it is known that if the area is overcast, the peak load will occur much earlier in the evening. Thus, if the Weather Fax predicts extensive cloud covering for the area tomorrow, the proper steps can be taken by management to meet the expected early peak load.

The recorder uses dry, electro-sensitive paper in roll form, 18½-in. wide. The received facsimile signals are amplified and applied to the stylus. The potential is sufficient to remove the white coating of the paper, exposing the carbon base, to produce a recording.

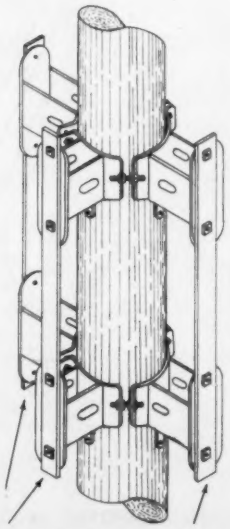
Jig-Strap Eases Pole Work

TOMMY K. RHODES, Journeyman Lineman, Kansas Gas & Electric Co.

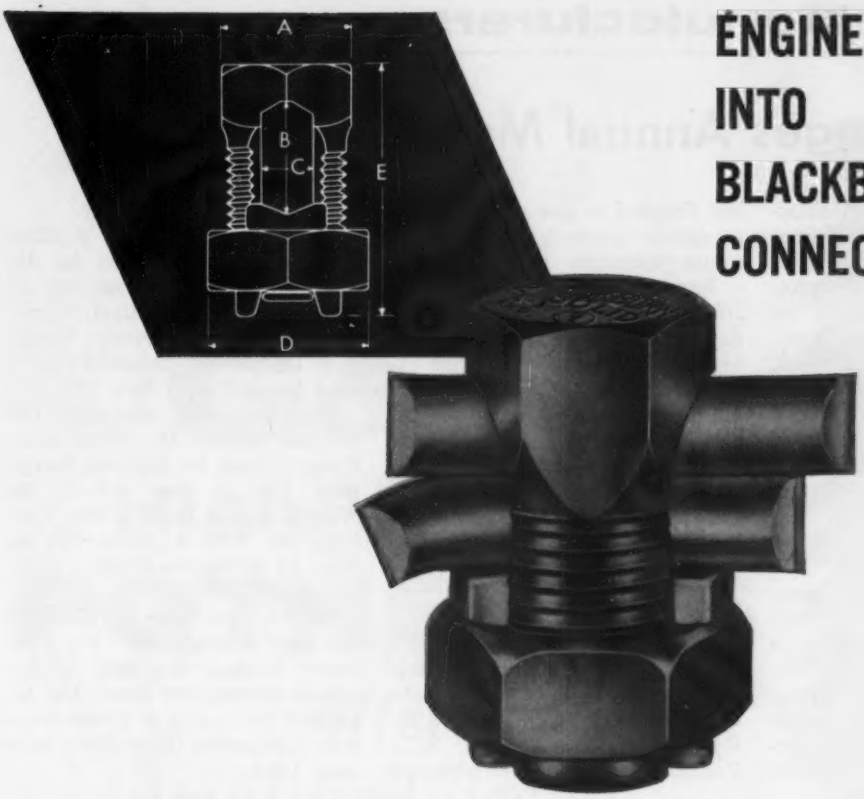
Cluster-mounted transformer brackets at Kansas Gas & Electric Co are pre-assembled on the ground with the aid of a jig, to cut pole work installation time in half. Also, experience has shown that a neater installation is achieved.

The jig or template consists of a strap-iron brace, 1¼-in. wide. This jig-strap is cut and drilled to the proper dimensions to establish the required spacing between the top and bottom bracket.

Paired brackets, top and bottom, are bolted to a single jig-strap. Sufficient sets of jigged brackets are pre-assembled, as required by the particular transformer application. Individual jigged-bracket sets are raised and placed in initial positions on the pole. When the last of the jigged-bracket sets are in position and interlocked-bolted, the jig-straps can readily be removed to allow the transformers to be installed.



1¼" STRAP BRACES



ENGINEERED INTO BLACKBURN CONNECTORS...

REUSABILITY!

The big difference in Blackburn connectors starts with the way they are made. The basic material is high strength duronze, a silicon bronze alloy stronger than many structural steels.

High percentage of threads, both bolt and nut, plus proper selection of materials, reduces friction, increases thread efficiency and clamping force—clamping force is maintained on the conductors. Blackburn's strict inspection assures uniform high quality.

Blackburn connectors give better performance electrically. The greater thread efficiency provides a high clamping force that helps break through oxides on the conductor and improves conductivity. This high initial conductivity is maintained permanently.

Because of the better materials, precision workmanship and careful inspection, Blackburn connectors are reusable . . . over and over. Write for samples.

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NEMA Changes Annual Meeting Format

National Electrical Manufacturers Assn has changed the format for its annual meetings this year. The 34th annual (top-level) meeting will be held Nov. 17 at the Savoy Hilton Hotel in New York. In other years, section sessions, mostly technical in nature, have been interspersed with two general membership luncheons, climaxed by a dinner program. This year, division meetings will take place at various locations and times.

General Meeting

Attendance at the general meeting will be by invitation. The day's program will be highlighted by a symposium, with the industry's outstanding scientists participating. They will discuss research and its practical implications to the electrical manufacturing field. Program was designed to give manufacturers a realistic approach to solution of future production problems.

Announcement of newly elected NEMA officers will be made at the day's luncheon and awards given to three top member company executives. Tributes will represent outstanding contributions to the electrical industry and the business community in general.

The meeting will open with a discussion of NEMA's activities, present and planned, also adoption of its 1961 program and budget.

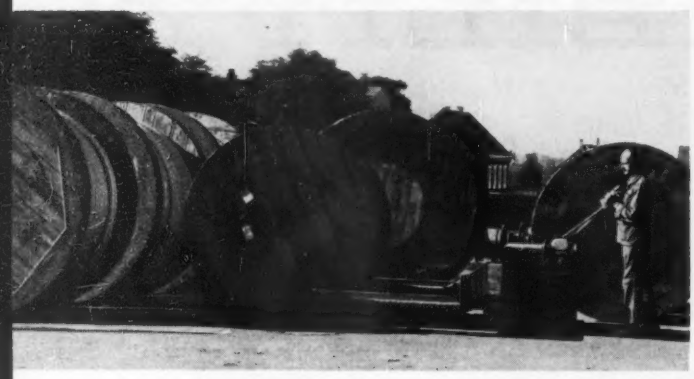
Division Meetings

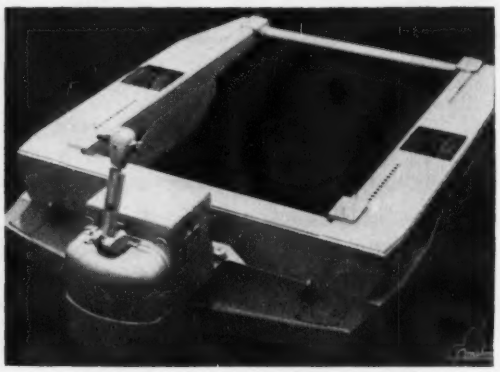
Preceding the annual meeting, a series of NEMA division meetings are scheduled: three in Atlantic City, others in New York City, Rye, N. Y., and Absecon, N. J. Product sections affiliated with each division meet simultaneously.

Manufacturers in the Building Equipment Div will open the Atlantic City series of meetings on Nov. 14. The Generation, Transmission and Distribution Equipment Div and the Industrial Equipment Div will meet Nov. 15.

The Insulating Materials Div will meet on Nov. 15 at Westchester Country Club; the Lighting Equipment Div on Nov. 16 at the Waldorf Astoria Hotel in New York City; the Wire & Cable Div on Nov. 20 at Seaview Country Club, Absecon, N. J.

NEMA's two other division will not meet in November. The Consumer Products Div held its first annual meeting last June. The Industrial Electronics & Communications Equipment Div will not meet until 1961.





Cable-Drum Lift Truck Built in West Germany

A West German firm, H. Jungheinrich & Co, has built a lift truck for handling cable drums up to ten tons without pallets or platforms, requiring only one operator.

The operator moves the truck backward, forks lowered, until cable drum is positioned between the forks. Cams on the upper side of the forks permit handling of drums of various sizes. Backward support consists of a mobile rod to be fitted by the driver into respective cams.

Steering handle is ground-operated at angulation of 100 deg either left or right, but can be swung backward for rider operation. Speed control lever on head of steering handle provides fingertip operation at two speeds forward and backward: speed, unladen is 3 miles per hr and laden it is 1½ miles per hr.

Lifting is effected electro-hydraulically by means of gear pump and pressure cylinder, operated by press button on steering handle. A foot pedal is used for lowering.

The 24-v, 350-amp-hr battery has 12 cells. Vulcanite-lined container protects it against acid.

Plant is enclosed in a heavy, welded steel plate frame.

(*More News of Manufacturers, p* 70)

Improved

G&W

High Voltage

POTHEADS

offer simplified design; lower cost

Simplification of G&W's original Type AT pothead design has resulted in lowering costs of the new high voltage pothead line, ATA-N and ATL-N. The outstanding mechanical and electrical characteristics which have been responsible for the fine performance of the original Type AT potheads have been retained. Maximum interchangeability of parts is one of the advantages gained by the simplified design. Also, the use of a straight-through type ferrule provides a more stable connection to the overhead line.

A new means of retaining gaskets is a definite improvement in sealing against high pressure. Successful tests up to 750 psig of hydrostatic pressure indicate that these improved G&W Potheads have superior performance characteristics under operating static heads in excess of 200 psig (nominal).

Type ATA-N and ATL-N potheads are another example of the constant improvement being made in G&W products. Their performance and dependability is based upon G&W's thorough understanding of electrical and mechanical requirements for cable accessories gained from 55 years of engineering development, testing, and operating experience. Consult with a G&W Representative on your present and future cable termination needs, or write us for full information.

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AT60-1

*Trademark

"Superforms* make my Budget Dollars go farther"
... PURCHASING AGENT

"We have to look at budgets as investments . . . in terms of *return* . . . all the way from negotiating and pricing, to having equipment available when needed for use.

"With Fanner Superforms, we get *prompt quotations* from the Agent and the Factory . . . they *meet their commitments* . . . give *reliable service.*"

These are reasons why more and more Purchasing Agents are buying more and more Superforms. A-1695A

FANNER
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"PROTECTIVE TWIST"

ARMOR RODS...
Protect long-span T&D lines at supports

LINEGUARDS...
Protect short-span T&D lines at supports

PATCH RODS...
Repair damaged conductors

TAP ARMOR...
Protects conductor at tapping points

FANNGRIPS...
For dead-ending strands and conductors

FANNSPLICES...
Join two ends of conductor wire

PLASTIC PRODUCTS...
For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

2nd and 3rd Largest UK Electrical Firms May Merge

English Electric and General Electric Co Ltd (no connection with General Electric Co) are considering a merger. Observers note this as part of continuing consolidation within the British electrical industry which seems inevitable. Move would produce a holding company with assets of about $500 million and annual sales of over $800 million, comparable in size to Britain's largest electrical manufacturer, Associated Electrical Industries.

EE, Britain's second largest electrical firm, concentrates on heavy electrical equipment; GEC, third largest, concentrates on consumer goods, but is also in the utility and industrial markets.

Growing competition and shrinking profit margins are problems the British electrical industry is encountering. The *Times of London* comments, "A merger between EE and GEC will clearly not rescue the United Kingdom heavy electrical industry from its too-well-known difficulties overnight, but it should prove a step in the right direction."

About three times the production capacity in generating units needed to take care of the home market can be produced. Exports can make up only part of the gap and fierce international competition doesn't allow much profit, says British trade source. Cutbacks in the nuclear power program have reduced the number of nuclear power consortia to three; this number may now go down to two, for EE and GEC belong to different consortia. The cable and electric lamp business have been badly hit by the ending of price agreements. Restricted consumer credit has had an adverse effect on appliance sales.

Switching System Uses Molded-Case Breakers

I-T-E Circuit Breaker Co announces development of a new automatic transfer switching system. Motor operators are used in tandem with molded-case circuit breakers. The circuit breakers and the Telemand motor operators are produced by I-T-E in switchboards built by Lexington Electric Products Co.

Telemand can be wired for almost any system desired and can be added to breakers in the field without removing them from service. It adds only 6 in. to overall breaker depth. I-T-E molded-case breakers, in continuous current ratings from 70 through 800 amp, to 600 ac and 250 dc, including Cordon current-limiting units, can be used with the motor operators.

First installation was made for the New Jersey Bell Telephone Co at Wildwood to guarantee continuous power through automatic transfer from the normal utility power source to an emergency generator. The Wildwood telephone building receives incoming utility power at 120/208 v which passes, after metering, through one of two electrically, mechanically interlocked 800-amp molded-case circuit breakers.

The system, says I-T-E, is applicable for remote, timed control of outdoor lighting at large parking areas and shopping centers, and for remote control of breakers located in inaccessible areas. The use of two breakers assures uninterrupted service for such facilities as hospitals, department stores, and other public gathering points.

MANUFACTURERS BRIEFS

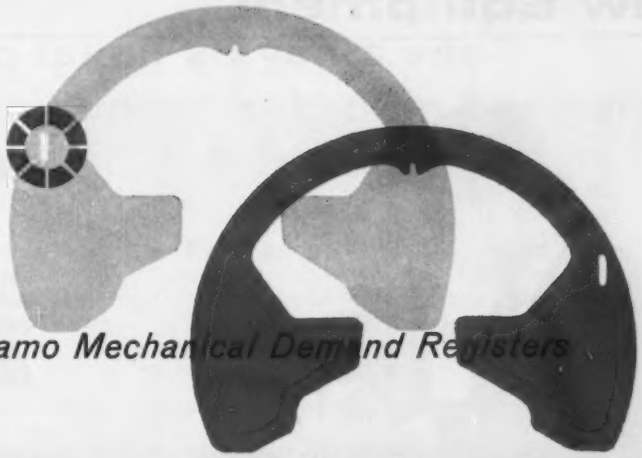
• **Federal Pacific Electric Co** reports $100,194,175 net sales and $2,767,815 net earnings for fiscal year ended June 30. These include Cornell-Dubilier's sales and earnings, also incorporate net loss of $395,543 for last quarter of C-D's Sept. 30, 1959 fiscal year. FP's fiscal year, 1959, net sales were $62,724,709, net earnings were $2,307,494, exclusive of C-D figures.

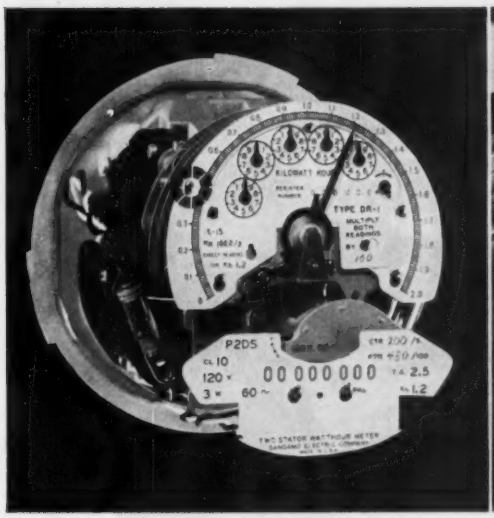
• **D. W. Onan & Sons, Inc,** has become a division of Studebaker-Packard Corp. Onan sales totaled $14,941,000 in 1959, pre-tax earnings, $1,945,000.

• A delegation of 25 US engineers including four from **Westinghouse** will attend an International Electrotechnical Commission meeting in New Delhi, India from Oct. 29 to Nov. 12. The commission's purpose is to seek agreement among its 35 member nations on international standards in every area of the electrical industry.

DOUBLE THE RANGE WITH A SCREWDRIVER!

with New Sangamo Mechanical Demand Registers





Developed to meet your needs, the Sangamo Dual Range (DR) Mechanical Register features a "flip-over" scale plate that permits rapid changes in range while assuring interlock between scale and range selected. The new DR Mechanical Register is designed to improve metering accuracy with load growth, reduce register change-outs, and cut your inventory costs by reducing the number of meters and registers you have to keep in stock.

No screws to remove... (and lose!) On the DR Register, range can be changed in the field by simply loosening (not removing) screws and reversing the scale plate. Removing the scale releases a spring-loaded pin which automatically changes gearing to double the capacity of the register. Only one gear shaft moves when the spring-loaded pin is actuated; positive interlock between pusher arm gearing and the scale is assured. The register does not require readjustment after the operation.

One percent full scale accuracy maintained. The Sangamo DR Register is rated —1% of full scale. This high accuracy is maintained because eccentricity errors and motor field interference are negligible. The register, which retains all traditional features of Sangamo Type D Mechanical Registers is available for singlephase and polyphase meters in both universal and standard scales.

Remember, you can always look to Sangamo for "Acknowledged Leadership in Demand Measurement."

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM60-6

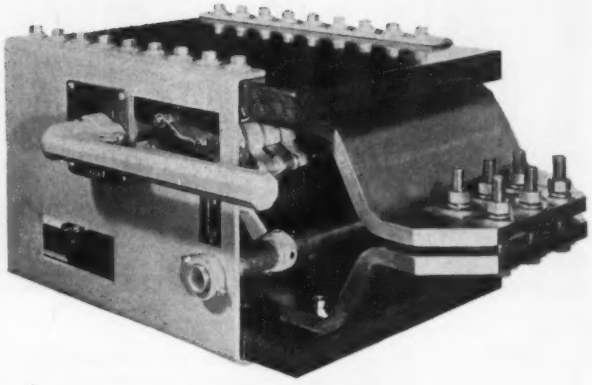
New Equipment

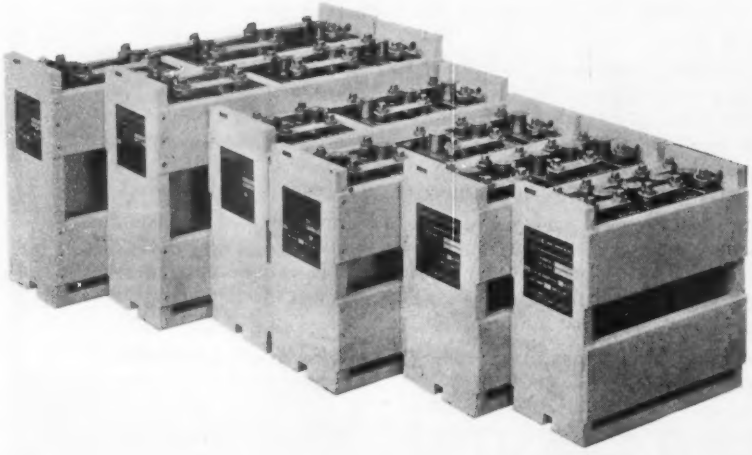
Telemetering System . . .

. . . with all-transistor construction will telemeter any quantity, such as watts or volts, that can be converted to a dc millivolt signal. The space-saving modular units afford easy maintenance and quick changeover of input, output and carrier frequency ratings.
General Electric Co, Schenectady 5, N. Y.

Disconnect Switch . . .

. . . for heavy industrial use is rated at 750 v, 5,000 amp. For multiples of 5,000 amp, gang-operated units can be installed. Both single-throw and double-throw units are offered for this copper "wedge"-type switch, which can be bolted directly to the buswork without other means of support. An auxiliary blade with arcing tip closes first and opens last.
Delta-Star Electric Div, H. K. Porter Co, Inc, 2437 Fulton St, Chicago 12, Ill.





Batteries . . .

. . . of nickel-cadmium type are suited to extremely intermittent power demands, to locations where only infrequent maintenance is possible and to installations where batteries must remain capable of high rates of discharge despite long periods of idleness. The industrial storage batteries are available in 22 8-hr ratings from 10 to 450 amp-hr.
Exide Industrial Div, Electric Storage Battery Co, Rising Sun and Adams Ave, Philadelphia 20, Pa.

(*More New Equipment on page* 74)

Cost-cutting step taken 26 years ago still paying off at Hamm Brewery —they chose NONPAREIL Turbine Oil

Situation: In 1934 the Theo. Hamm Brewing Company installed two 1,000 kw. turbines. The brewing firm wanted to be sure there would be no downtime due to failure of the lubricant. Neither did the company want to spend time checking the oil's performance or adding new oil to sweeten the old.

What was done: Brewery management followed the advice of the Standard Oil lubrication specialist. They installed NONPAREIL Turbine Oil, the only oil, then as now, that carries with each fill a life-of-turbine guarantee.

What has happened: In 26 years since the turbines were put in service there has never been any downtime due to lubrication problems. In 1947 a 2500 kw. turbine was added to the system and another 3000 kw. unit was put in service in 1953. These, too, have used NONPAREIL Turbine Oil with the same results.

What you can do: Get the full story on NONPAREIL Turbine Oil from the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about **NONPAREIL Turbine Oil**

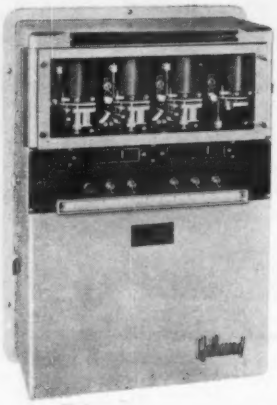
- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

You expect more from **STANDARD** *and you get it!*

Hamm Brewing Co. assistant chief engineer Steve Wappel and Standard's Dick Anderson discuss recent oil analysis. Dick Anderson knows his way about an industrial power plant. He's been providing customers with technical service on lubrication for five years. Dick has an engineering degree from the University of Minnesota and has completed the Standard Oil Sales Engineering School.

Hathaway

designed



and produced to fulfill the needs of the power industry

HATHAWAY'S RS9-30 Automatic Oscillograph serves as a watchdog at various points on power systems recording magnitudes and duration of faults and transients. HATHAWAY'S RS9-30 also is used for monitoring the operation of relays and circuit breakers, including staged testing. The records indicate the complete sequence of operations on all protective equipment.

Exclusive features of HATHAWAY'S RS9-30

• Records up to 32 INDEPENDENT CHANNELS • Twelve inch chart width • Selective chart speed (3 OR 12 INCHES PER SECOND) • Cartridge loading (UP TO 300 FT. CAPACITY)

Choice of 12 OR 125 VOLT DC MODELS • Simplified Maintenance • CENTRALIZED FRONT PANEL CONTROLS

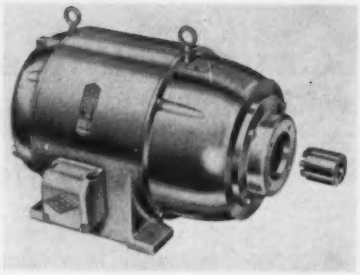
Hathaway

HATHAWAY INSTRUMENTS, INC.

Division of HATHAWAY INSTRUMENTS, INC.

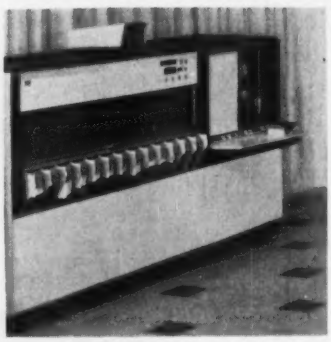
5800 East Jewell Ave., Denver 22, Colorado . . . Phone SKyline 6-8301

Phone, Write or Wire



Pump Motors . . .

. . . in intermediate ratings permit close matching of hydraulic-pump and motor horsepower ratings. Polyphase, dripproof and totally enclosed units are available. The intermediate ratings include 2½, 4, 6¼, 8¾, 12½, 17½, 22½, 27½, 32½, 35, 37½ and 45 hp.
Reuland Electric Co, Alhambra, Calif.



Reading Machine . . .

. . . reads printed data recorded in standard IBM type or elongated 407 type, as well as vertical marks made with ordinary pencil or dark ink. The solid-state optical character reader translates into machine language at 480 characters per second. It handles paper and card forms of various sizes and thicknesses.
Data Processing Div, International Business Machines Corp, 112 E Post Rd, White Plains, N. Y.

Pole-Type Transformers . . .

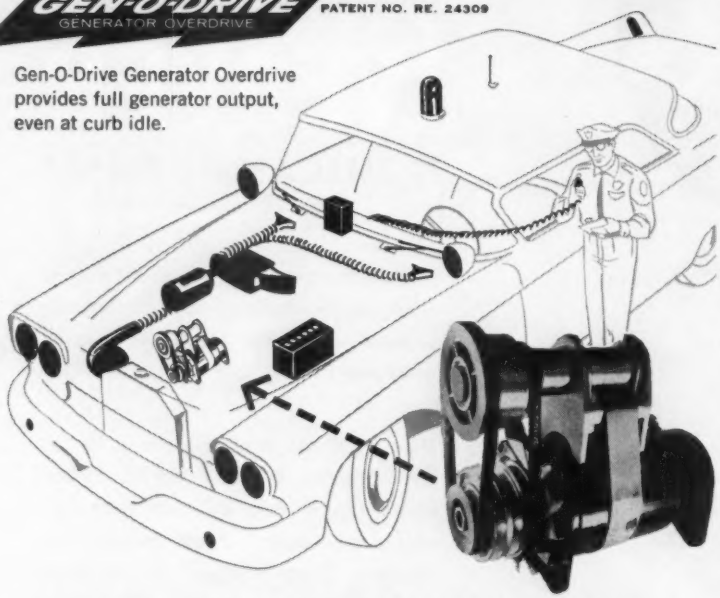
. . . rated at 500/560 kva, single phase, are lighter than their predecessors. The new units for 2,400/4,160-v primary are 24 in. shorter, and the 7,200/12,470-v transform-

new! always RIGHT FOR ANY BI-METAL OR Al TO Al CONNECTION
WEAVER
PARALLEL GROOVE CLAMPS
ni-cad* COATED!
The weatherproof NICAD coating (over a hi-strength aluminum body) keeps any bi-metal connection troublefree, come what may: Heat, cold, salt, alkali, you name it!
They eliminate trouble caused by... (1) Oxidation of Cu against Al; (2) Unequal expansion or contraction of lines and clamps during severe temperature changes. Contacts stay tight—no arcs.
NO SEPARATE INSERTS TO CATCH MOISTURE AND CAUSE CORROSION! NO SOLDERED JOINTS!
Permanent Low-Resistance Connections
WRITE FOR SAMPLES FOR TESTING
Five sizes now available (NI-CAD coated or non-coated) to cover all requirements.
*Extremely heavy coating of cadmium and other corrosion resistant elements
2110 HOWARD ST. • ST. LOUIS 6, MO. • GArfield 1-6336
J. A. WEAVER Company

FULL ELECTRICAL POWER
at any engine speed!

GEN-O-DRIVE® GENERATOR OVERDRIVE PATENT NO. RE. 24309

Gen-O-Drive Generator Overdrive provides full generator output, even at curb idle.



KEEPS BATTERIES CHARGED!

End battery-generator breakdowns. New improved-model GEN-O-DRIVE offers efficient, dependable service. Assures maximum battery charge at any speed, *even with all accessories operating!*

Slow speed, long idling periods, sirens, warning lights . . . nothing can drain your battery. GEN-O-DRIVE gives top generator output. Prevents rundown batteries, cuts maintenance and costly replacement.

Economical! GEN-O-DRIVE needs no periodic service. Lubricated for life! No battery replacement . . . extends battery life. Full guarantee.

NOW! TWO SOURCES OF POWER FROM ONE GENERATOR!

Watt Power® AC-DC GENERATOR Patent No. 2,939,975

WATT POWER AC-DC GENERATORS fit all F-L-M, D-R, Autolite systems. Provide normal DC and up to 1200 watts of 110-volt AC current!

RETURN COUPON FOR FULL DETAILS

CONSOLIDATED GENERAL PRODUCTS, INC.
P. O. Box 7425C, Houston 8, Texas

Send complete information on: ☐ Gen-O-Drive ☐ Watt Power Generators

Name_____

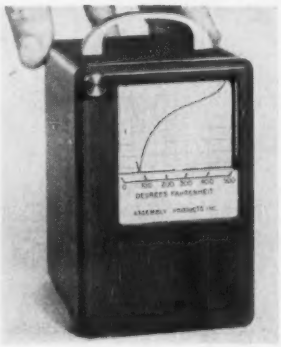
Address_____

City_____ State_____

ers also save on space. They are furnished with internal-operation tap changers and oil-sampling drain plugs, but without liquid-level gauges or thermometers.
General Electric Co, Schenectady 5, N. Y.

Compression Connector . . .

. . . of interlocking key type is for installation with a WH-2 tool. These 2-piece aluminum connectors are for 266.8-MCM to 636-MCM ACSR mains and taps. The fittings are available in the T type, bolted-tap T type, L-type tap and cross-tap units, and other types.
James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.



Temperature Recorder . . .

. . . operates directly from a thermocouple without signal amplification. The only other connection needed is to 115-v ac supply. Temperature ranges are 0-500F and 0-2,500F, with 2% accuracy. Standard chart speed is 1 in. per hr.
Assembly Products, Inc, Chesterland, Ohio.

NO MORE ENGINE IDLING

. . . with NEW MOTOROLA MOTRAC* 2-way radio

Idle a truck engine 4 hours a day—to regenerate for battery drain due to 2-way radio—and you waste *more than a hundred dollars* a year in gasoline alone! Add the cost of engine wear, replacement batteries, generators, etc., and you've got a significant cost leak.

But now it's *unnecessary*. Motorola MOTRAC radio uses only a trickle of current—less than a dome light—so engine idling is *out*. And that's just the *start* of MOTRAC radio savings. Truly advanced design and rugged construction give you greater *reliability*, and much longer life.

Here is truly dependable equipment for long-run economy.

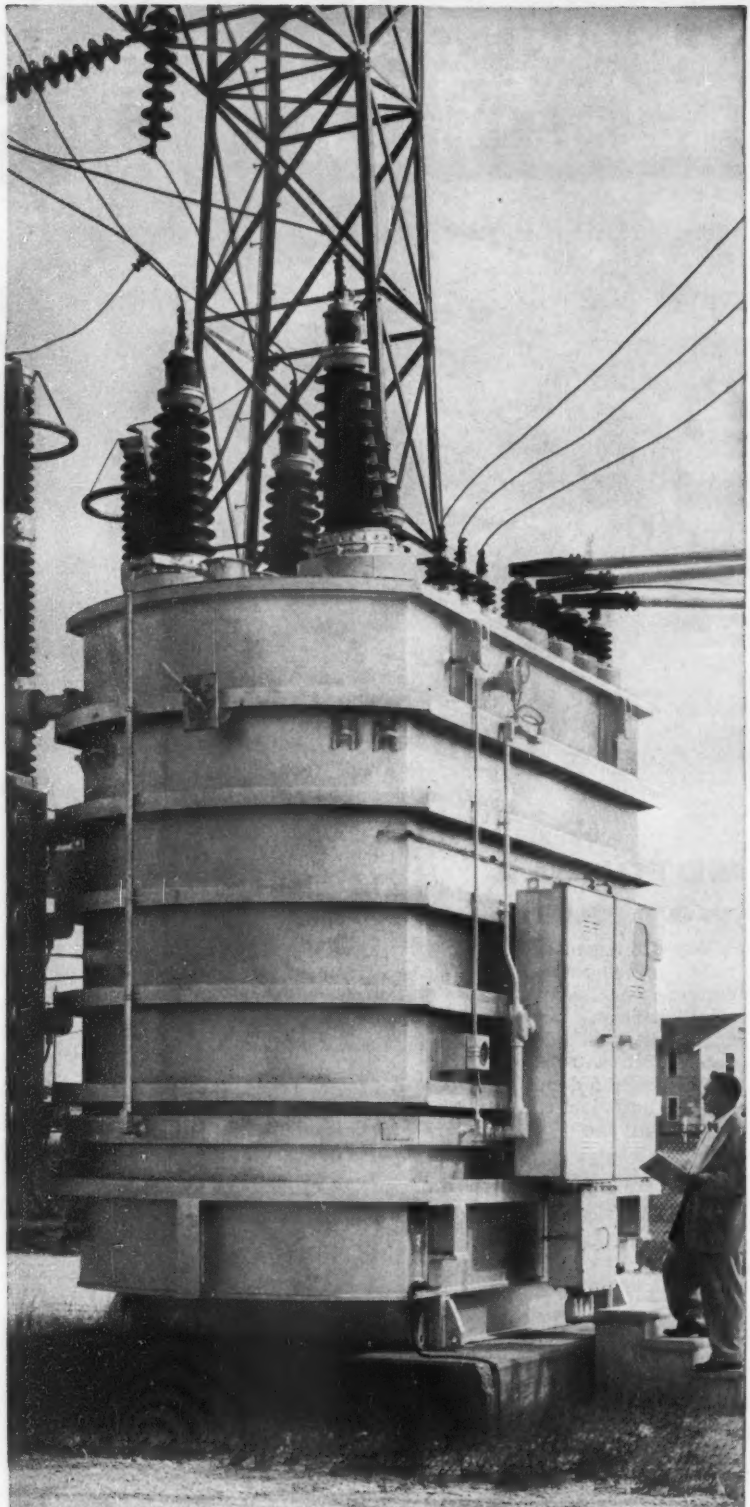
It's a big story. Get all the facts about this outstanding new radio. Call or write today.

HERE'S THE INSIDE STORY—Commonest source of maintenance problems—vibrators and receiver tubes—have been replaced by dependable transistors. MOTRAC radio can be used with any 6 or 12 volt vehicle—positive or negative ground. Models available with up to 100 watts power output.

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 A[illegible]sta Blvd., Chicago [illegible] Subsidiary of Motorola [illegible]

*MOTRAC is a trademark of Motorola Inc.



Installation view of a high efficiency 53,333 kva power transformer

UNIVOLT® 35 TRANSFORMER OIL

High Oxidation Stability... Low Power Factor

Univolt 35 is an outstanding transformer oil because of its excellent oxidation stability, low power factor and lasting insulation action. This dependable, proved-in-use product is refined from a high quality, specially selected straight mineral oil. Its highly desirable characteristics include low viscosity, freedom from acid, alkali and corrosive sulfur, and compatibility with the varnish finishes of coils.

Univolt 35 offers outstanding performance under the conditions of extreme heat produced by peak summer loads serving commercial and home air conditioning. The utmost care is taken in transporting Univolt 35: it is shipped in specially prepared and inspected tank cars which are loaded indoors.

Univolt N36 is another high quality transformer oil. Perfected by Esso Research, it possesses all the characteristics of Univolt 35 plus an effective oxidation inhibitor. For complete information write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

Electrical World

OCTOBER 17, 1960

Management Newsletter

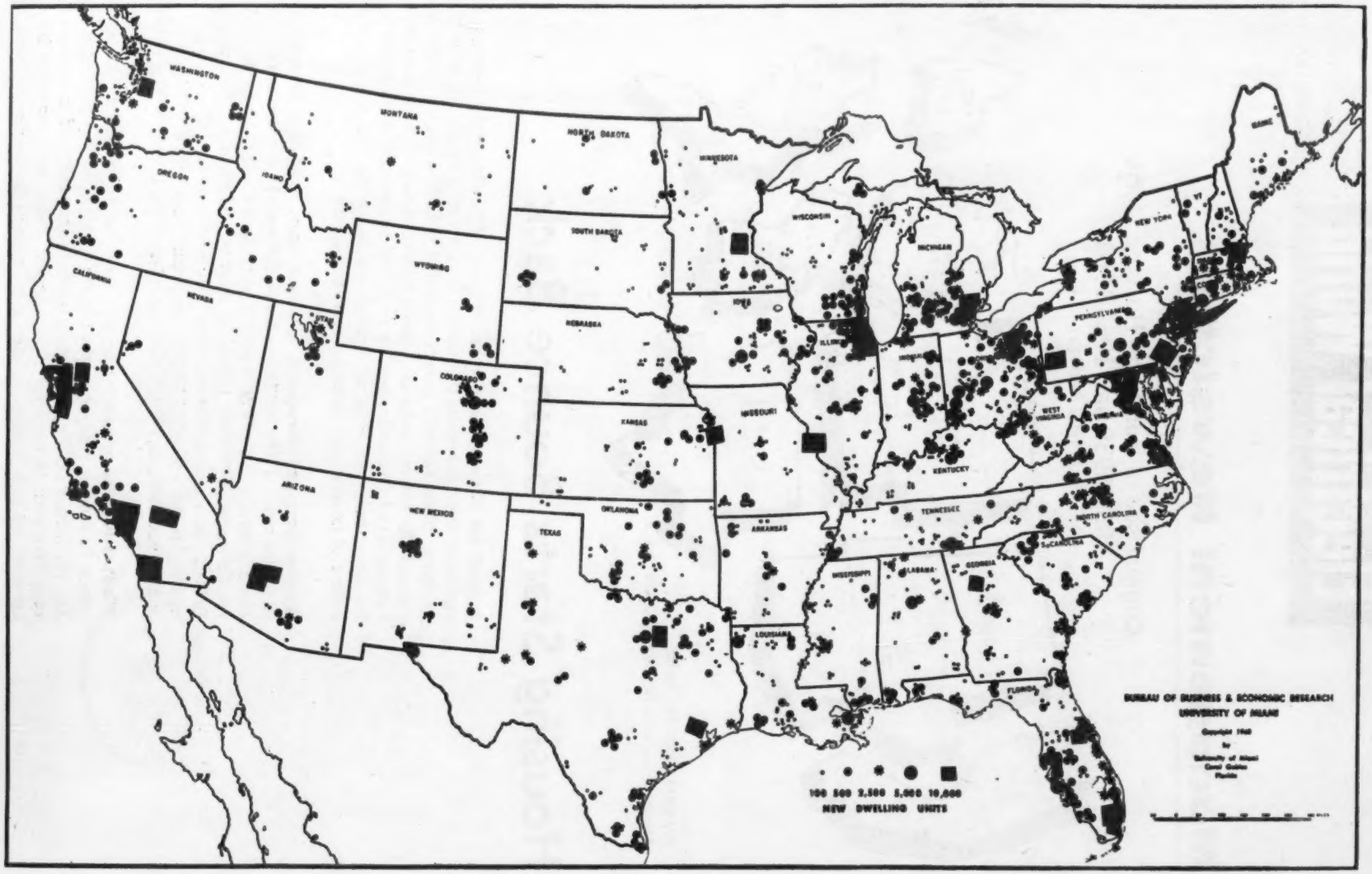
Housing Starts Bounce Back

A small but distinct change in the ebb tide of housing starts promises to be a significant force in keeping the nation's economy on a steady course in 1961, and in getting residential load growth under full sail. First inkling of the turnabout came in the housing starts in August. In that month, reports the McGraw-Hill Department of Economics, new starts showed an increase of about 8%. And, at the same time, both FHA applications for mortgages and VA appraisals, two indices of housing developments, rose substantially.

Another promising forecast is a recent study predicting housing starts at an annual rate of 1,350,000 for the 1960-1964 period, compared to only 1,290,000 annually for the 1954-1959 period. The prediction, made by Dr R. P. Wolff of the University of Miami's Bureau of Business and Economic Research in Coral Gables, Fla., estimates that the 1960-1964 period will set a new record for home-building, with a total of 6,750,000 non-farming housing starts. A gradual increase in 1960 and 1961, says Wolff, with a speed-up in the last three years of the period.

What's behind the upsurge? Basically, three factors: money, mechanization, and babies. In January, housing looked like the only laggard in a good economy (EW, Jan. 18, 1960, p 81). But then money was high and scarce and the demand for it by competing parts of the economy was strong. Now, most industries have excess capacity and high inventories, they aren't pushing the lenders so hard.

Forecast for 1960-1964 Shows Number of Non-Farm Housing Starts by Areas



Government action to thaw out credit has had an effect too. Money is easier to get now and rates somewhat lower. More heat to break the ice jam comes from the two-year extension in GI loans recently passed by Congress and in revision in FHA practice to permit sale of mortgages to individuals. Backing up these changes are the continuing move from farm to city, and the rising household formations.

Where will the new housing go? The map on page 79 shows the new housing starts by regions for 1960-64 and the comparative figures for 1955-59. A more detailed breakdown, showing starts for local areas, appears on page 80.

But even more promising from the utility viewpoint than the growing housing market is a subtle but definite change in the nature of market. Today's homebuyer is a more sophisticated shopper. Unlike the post-war buyer, who had to settle for almost any roof over his head, today's purchaser frequently already has a home. He has definite ideas of the conveniences and improvements he wants in a new one. And his new standards usually mean more kilowatt-hours on the meter.

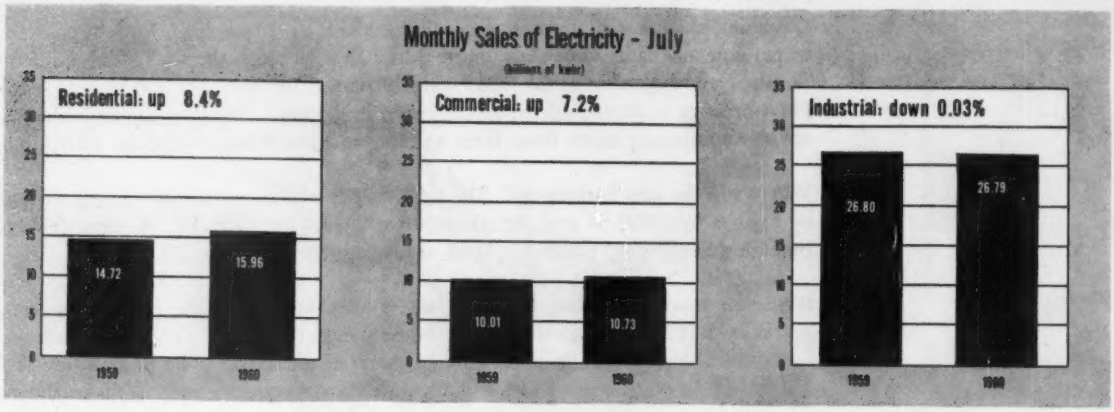
A recent Business Week survey makes the pattern clear. Although many builders with basic, mass-produced homes are meeting rising consumer resistance, an alert minority of builders are moving all they put up. Why the difference? Because this market-sensitive minority, though putting up a moderately priced ($15,000 to $18,000) product, are turning out custom-built homes, with a few extras thrown into sweeten the pie. The extras—usually electric ovens and dishwashers.

And Dr Wolff's analysis shows a supporting trend. There is, he maintains, considerable evidence that today's home-seeker will buy more expensive housing if he can arrange easy financing. Accounting for the change, Dr Wolff cites two factors: inflation psychology and a shift away from the expensive automobile as a status symbol. To electrical industry market analysts, well aware of the fierce competition for the consumer's dollar, a shift in spending from expensive cars to better homes, laden with large load-building appliances, would be sweet music.

Substantiation for these trends comes from the latest figures on Bronze and Gold Medallions awarded by NEMA. During the first eight months of 1960, when non-farm housing starts were down more than 12%, shipments of Bronze Medallions were off only 3.8% and Gold Medallions were *up* a whopping 31.7%, to 12,347—almost 50% of the 27,226 in the preceding 26 months. Estimates for the remaining four months of this year are 6,173 more. And estimates for 1961 show another 46,868 Gold Medallion homes, more than the total estimate for the entire Oct., 1957 to Dec., 1960 period. And though Bronze Medallion shipments are growing at a lower rate, estimates for Sept., 1960 to Dec., 1961 are 80,000 starts compared to the 99,000 shipped in the preceding 35 months. Together the estimated shipments of Bronze and Gold Medallions for this 15-month period total 133,000, about 10% of the total estimated new housing starts. This does not include other homes that meet standards but have not sought certification.

To put the Medallion statistics in perspective: Although the number of participating utilities has increased from 359 in January of this year to 577 by the end of August, some 94 commercial companies, long-time participants in the program, account for about 50% of the Bronze Medallion, and 67% of the Gold Medallions. (Requirements for a Bronze Medallion are an electric range, three major electric appliances, lighting that meets Light for Living standards, and American standard wiring. In addition, Gold Medallion homes must have all-electric heat.)

Small potatoes out of the total new starts? At the moment, perhaps. But if Dr Wolff's prediction that the expensive car is declining as a prestige symbol is correct and if the modern, well-equipped electric home is to replace it as a symbol of affluence and status in the eyes of the American public, then this 10% may well be the first swell in a tide of new business for electric utilities and manufacturers.



Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity, Dec. '59 Peak, Est. Dec. '60 Peak	million kw	July / July	162.83 / 121.6 / 133.7	151.53 / 113.5 / 134.3	7.5 / 7.2 / −0.4
Production—billion kwhr		July	63.53	61.69	3.0
Hydro			11.89	11.48	3.6
Fuel			51.64	50.21	2.8
Sales—billion kwhr		July	56.95	54.82	3.9
Residential			15.96	14.72	8.4
Commercial			10.73	10.01	7.2
Industrial			26.79	26.80	−0.03
Other			3.47	3.29	5.5
Fuel Consumption		July			
Coal—million tons			13.60	13.63	−0.2
Oil—million barrels			5.48	6.00	−8.7
Gas—billion cu ft			190.99	182.19	4.8
Net Income Class A & B Co's—$ million		July	133.56	122.72	8.8
Residential Customers—millions		12 mos.	49.54	48.37	2.4
Revenue per kwhr		ended	2.48¢	2.52¢	−1.6
Avg kwhr per customer		July 31	3,730	3,470	7.5
Avg annual bill			$92.50	$87.44	5.8

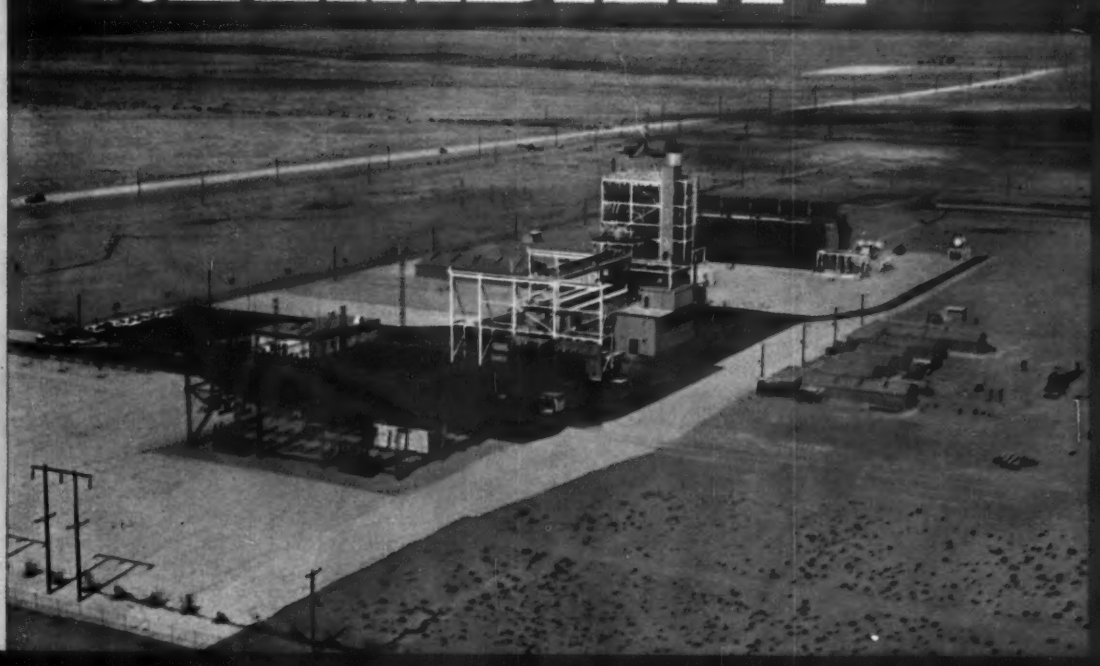
Business Statistics

Indexes: 1947–49 = 100				
FRB Industrial Production	Aug.	163	156	4.5
ENR Construction Cost	Oct.	173.9	169.9	2.4
BLS Cost-of-living	Aug.	126.6	124.8	1.4
New Orders for Machinery (1950 = 100)	Aug.	168	148	13.5
NEMA Sales				
Insulation materials	July	101	139	−22.9
Electric appliances		89	114	−21.9
Wholesale prices				
Motors and generators	July	141.4	145.9	−3.1
Transformers and regulators		142.4	149.7	−4.9
Switchgear and fuses		173.6	178.9	−3.0
GNP—annual rate—$ billion	2 nd qtr.	497.4	484.5	2.7

Significant changes: July appliance sales index, only 10 points above January figure, hit lowest point in five years, reflecting slow air conditioner sales.

FOR EL PASO . . .

LOW COST RELIABILITY

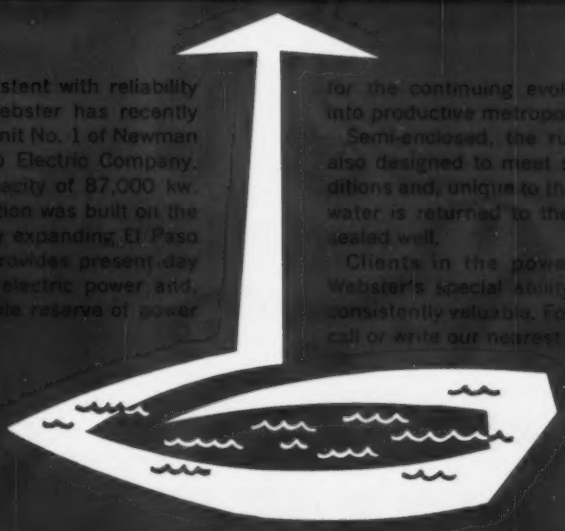


At the lowest cost consistent with reliability requirements, Stone & Webster has recently designed and completed Unit No. 1 of Newman Power Station for El Paso Electric Company. This initial unit has a capacity of 87,000 kw.

The Newman Power Station was built on the desert north of the rapidly expanding El Paso community. This station provides present-day El Paso with dependable electric power and, for the future, a dependable reserve of power for the continuing evolution of desert lands into productive metropolitan areas.

Semi-enclosed, the rugged Newman unit is also designed to meet severe sandstorm conditions and, unique to the site, deepwell cooling water is returned to the earth via a 1,200 ft. sealed well.

Clients in the power field find Stone & Webster's special ability and long experience consistently valuable. For complete information call or write our nearest office.

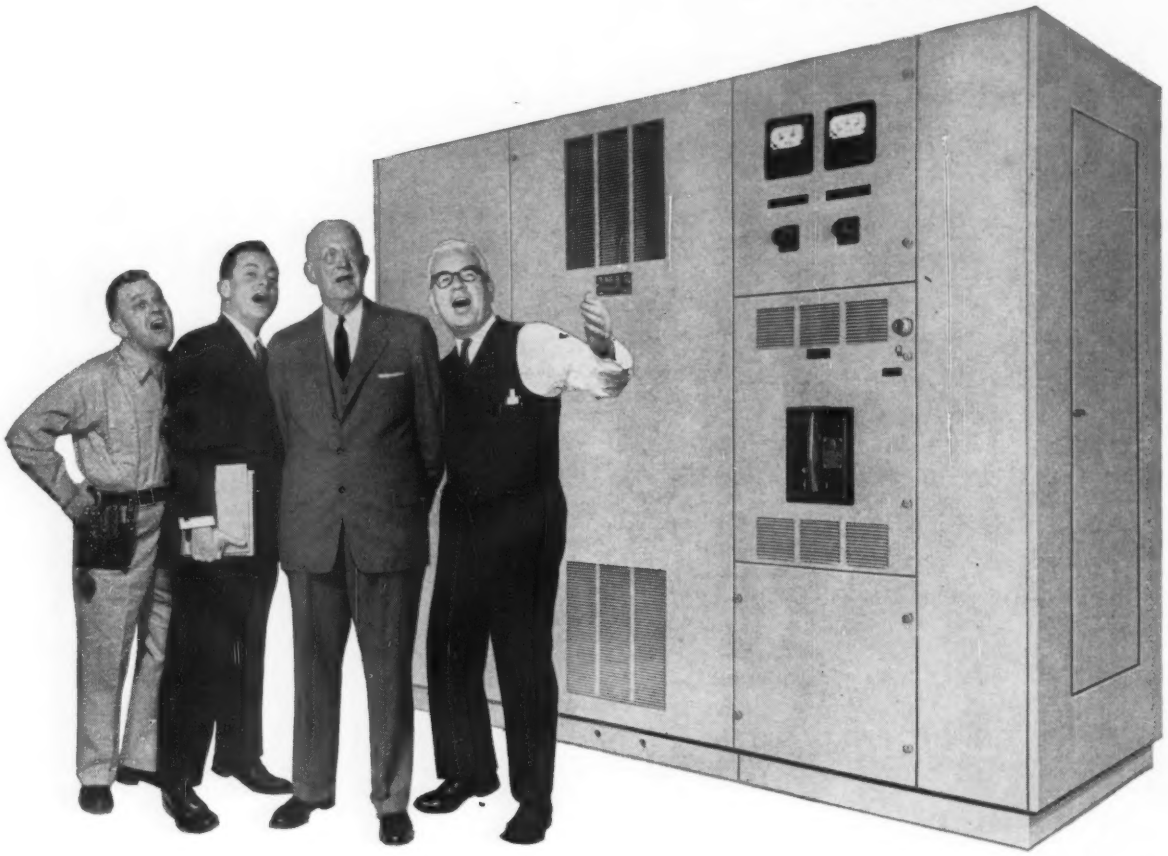


STONE & WEBSTER ENGINEERING CORPORATION

A Subsidiary of Stone & Webster, Inc.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Seattle Toronto

"WE BOUGHT THE I-T-E ♫ TRANFO-UNIT® BECAUSE..."



The TRANFO-UNIT is a complete, self-contained unit substation in a single package. It includes the primary disconnect, transformer, and secondary circuit protective devices.

"So easy to install. There's no complicated assembly at the site. You just position the TRANFO-UNIT and connect."

"Neat, attractive appearance. No hodge-podge arrangement of assorted gear. Saves space too. A real asset for any building."

"Greater safety. Everything is inside the TRANFO-UNIT. No exposed hot parts. It needs no fence."

"Better regulation. We put a TRANFO-UNIT in every load area. So we get better voltage regulation for all our lights and equipment."

"Economy. We buy our power at economical higher voltages. Then we put the TRANFO-UNIT right near the load. Cables can be smaller size, lower cost."

"Flexibility. I-T-E gives us complete custom design service. TRANFO-UNIT components can be selected to meet our particular requirements."

For supermarkets, schools, office buildings, factories and many other applications, the I-T-E TRANFO-UNIT is ideal. Available from 45 through 2500 kva. For complete information, write I-T-E Circuit Breaker Company, Dept. TR, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

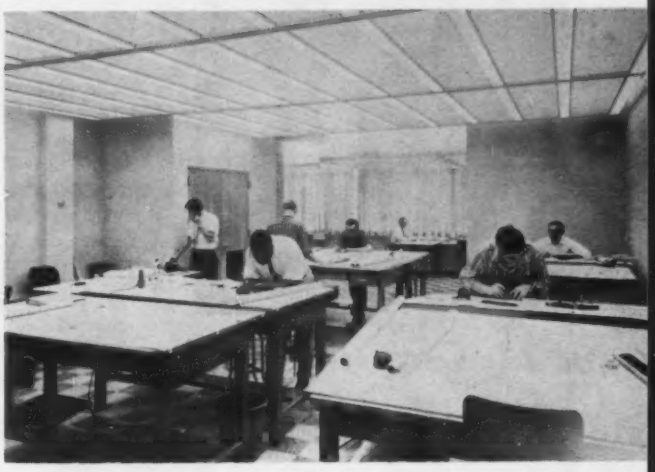
Improved Lighting Helps Draftsmen

Since the relighting of the drafting room at the Ralph L. Woolpert Co in Dayton, Ohio, the draftsmen say they are very happy with the new lighting and that it helps increase their efficiency with less physical effort, and the bright atmosphere makes for a pleasant working environment.

Forty-eight, 8-ft long units, mounted 10 ft from the floor and seven ft over the drafting tables, produce over 300 ft-c of shadowless, "very comfortable" illumination.

Walls are light green and floor tile is tan.

Total load for the installation is 12 kw.



SELLING BRIEFS

Third National **Lighting Exposition** will be held at New York City's Coliseum, March 5-8, 1961. A special World Lighting Forum will highlight the show with the presentation by national and international lighting experts of their latest findings. Twelve panel discussions will take place during the exposition as well as educational exhibits of over 200 manufacturers.

The **heat pump** as a ready-made solution to a part of the smog and air-pollution problems found in some sections of the country was suggested by Fred C. Wood, manager of air conditioning sales, York Division Borg-Warner Corp, at a recent meeting of the Southern California chapter, American Society of Heating, Refrigeration and Air Conditioning Engineers. Because there is no combustion, there are no gases, smoke or soot discharged into the atmosphere during either the heating or cooling season Wood said.

"The Big Deal," a triple barreled campaign to promote **dryer and dishwasher** sales is being conducted in October and November by Long Island Lighting Co. A free nationally known electric blanket will be given to LILCO customers who buy a cooperating manufacturer's dryer or dishwasher.

Philadelphia Electric Co wins "Socrates High Award of the Year" in recognition of consistently outstanding quality of its **newspaper advertising** during the past 12 months. Award was presented jointly to Ernest R. Laws, advertising manager, and Robert C. Cox, publicity manager. Judging was based on originality, layout, copy, art, and merchandising. Top utility companies for 1960 were: Philadelphia Electric, Cincinnati Gas & Electric Co, Kansas City Power & Light Co, Wisconsin Electric Power Co, Consolidated Edison Co of New York, Dayton Power & Light Co, Cleveland Electric Illuminating Co, and Southern California Edison Co.

Westinghouse Electric Corp will weather condition what is reportedly the nation's first completely **air-conditioned suburb.** The company will supply the heating, air conditioning and kitchen and laundry appliances for a 4,500-home development outside Washington, D. C. Contract calls for more than 20,000 appliances, the equivalent of a freight train 2½-miles long.

"Step Into A Bright New World" is title of **Medallion Home booklet** produced by General Electric Co. Thirty-two page booklet lists 16 total electric living benefits plus a number of dramatic decorating effects possible with inexpensive lighting. Checklist points up the advantages of the Medallion Home. Booklets, at 15¢ each, can be ordered from: Residential Market Development Operation, Dept 45-047, General Electric Co, 2100 Linden Avenue, Zanesville, Ohio.

Live Better Electrically Program has produced **slide/script presentations** of the 1961 Program showing current ads, promotional material and research findings. Prepared for use at utility fall sales meetings, presentations are designed to encourage appliance dealers, utility sales people and trade allies' support of the LBE approach. Order from: Edison Electric Institute, 750 Third Ave, New York 17, N. Y.

Boston Edison Elects Galligan VP

Thomas J. Galligan Jr has been elected executive vice president of Boston Edison Co.

He joined the utility in 1953 as director of stores and services. In 1957 he was appointed assistant to the president and the following year was made vice president. Last February he was elected to the board of directors.

From 1946 to 1953 he was a certified public accountant on the staff of Lybrand, Ross Brothers & Montgomery. He is a 1943 graduate of the Harvard Business School.

◀ THOMAS J. GALLIGAN JR

Triangle Conduit & Cable Names New Officers

J. G. Slater has been named vice chairman of the board of directors of Triangle Conduit & Cable Co. C. S. Menger has been made president and C. V. McKay executive vice president. John E. McAuliffe is chairman of the board.

Slater joined Triangle in 1933 as assistant treasurer. He then became treasurer in 1935, director in 1938 and vice president and treasurer in 1947. He was appointed executive vice president and treasurer in 1949 and president in 1958.

Menger joined Triangle as a sales supervisor after service in World War II. In 1948 he was appointed director of sales, became vice president in 1950, and in 1958 was named executive vice president.

SLATER MENGER McKAY

McKay joined the firm in 1944 from the War Production Board. In 1947 he was appointed assistant to the president, vice president and assistant to the president in 1950, and was named to the board of directors in 1958.

Ashby, King Elected VPs of Stone & Webster Service

ASHBY KING

Charles A. Ashby Jr and George C. King have been elected vice presidents of Stone & Webster Service Corp.

Ashby has been head of the firm's rate department since 1945. He first joined Stone & Webster in 1926 in the company's Boston office. Shortly thereafter he went to Blackstone Valley Gas & Electric Co as a rate engineer and power sales representative.

King has been a sales consultant for the Service Corp since 1954. Before that he was a sales manager for Boston Edison Co, Brockton Edison Co and El Paso Electric Co.

(*More News About People on page* 88)

TRAVELING WAVE ENGINEERING

Just Published. Presents modern methods of solving problems related to various wave phenomena by applying the powerful analytical techniques used in transmission line work. Makes clear the basic wave concepts for both transmission line and electromagnetic waves, and treats in detail the analogies for vibrating strings, acoustic waves, transverse waves in solids, heat conduction, diffusion, and the wave potential of quantum mechanics. **By Richard K. Moore, Univ. of New Mexico. 360 pp., 140 illus., $11.00**

TRANSFORMERS FOR THE ELECTRIC POWER INDUSTRY

Explains transformer design, construction, application, operation, and maintenance. Modern developments in temperature calculation, testing, estimation of eddy and stray losses, insulation, gauging the transformer's life span, fault detection, and the economics of transformer design and application are comprehensively covered. **By R. L. Bean, Nicholas Chakan, Jr., H. R. Moore and E. C. Wentz, all of Westinghouse Electric Corp. 426 pp., 277 illus., $12.50**

STEAM POWER PLANTS

Starting, Testing, and Operation

Here is a complete guide to steam power plants—physical set-up, various components, and techniques for efficient operation. Follows a steam plant right from the design and construction stage through the steps preparatory to starting, to organizing personnel and facilities, starting up the new plant for the first time, developing operating procedures, and arranging test routines needed to keep the plant up to top economy. **By Charles Donald Swift, Ebasco Services, Inc. 490 pp., 95 illus., $11.50**

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"MK-40" Switches are available in capacities from 400 to 4000 amperes—7.5 to 400 KV. For complete information, write to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill.*

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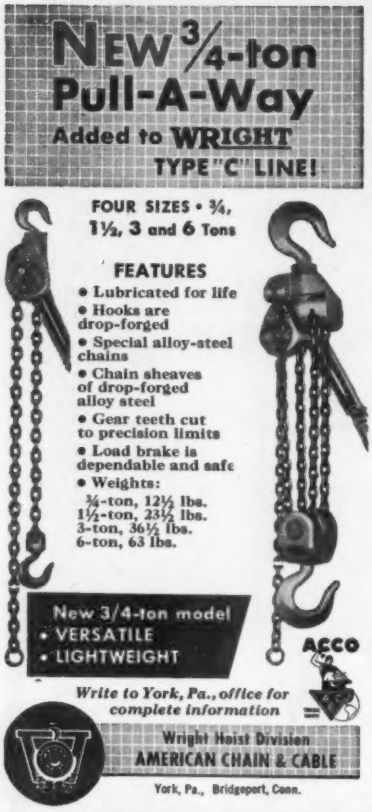


PERSONAL BRIEFS

Raymond Saibini has been promoted to assistant to the vice president in charge of operations at Sierra Pacific Power Co.

At Black Hills Power & Light Co, **R. A. Morrison** has replaced **Nick L. Didier** as manager at Sturgis, S. D. Didier has been transferred to Hot Springs.

F. W. Dehnert, formerly area superintendent for Niagara Mohawk Power Corp, Syracuse, has been named general superintendent-electrical operations, Buffalo.

The following changes have occurred in the American Society for Testing Materials: **Raymond E. Hess** has been named acting executive secretary; **Robert J. Painter** has become consultant to the executive secretary; and **Dr A. Allan Bates,** vice president of research and development for Portland Cement Assn, has succeeded **F. L. LaQue** as president of the society. LaQue, vice president and manager of development and research at The International Nickel Co, will continue as past-president of the society's board for three years.

William W. Williams has retired as utility engineer and manager of operations at Detroit Edison Co.

The following Montana Power Co personnel transfers have been made: **Louis G. Brewer** to Billings as assistant division manager and division superintendent; **Robert H. Jones** to Great Falls as division superintendent; **David C. Johns** to Butte as assistant to the vice president-electric operations; **Dan Pyfer** to the engineering department as supervisor of distribution engineering; **Walter G. Kelley** to Missoula as division superintendent; **Donald M. Leuschen** as assistant superintendent at Glasgow; **William Headapohl** to Billings as senior service adviser in the sales department; **Paul Schmechel** to the position of executive assistant.

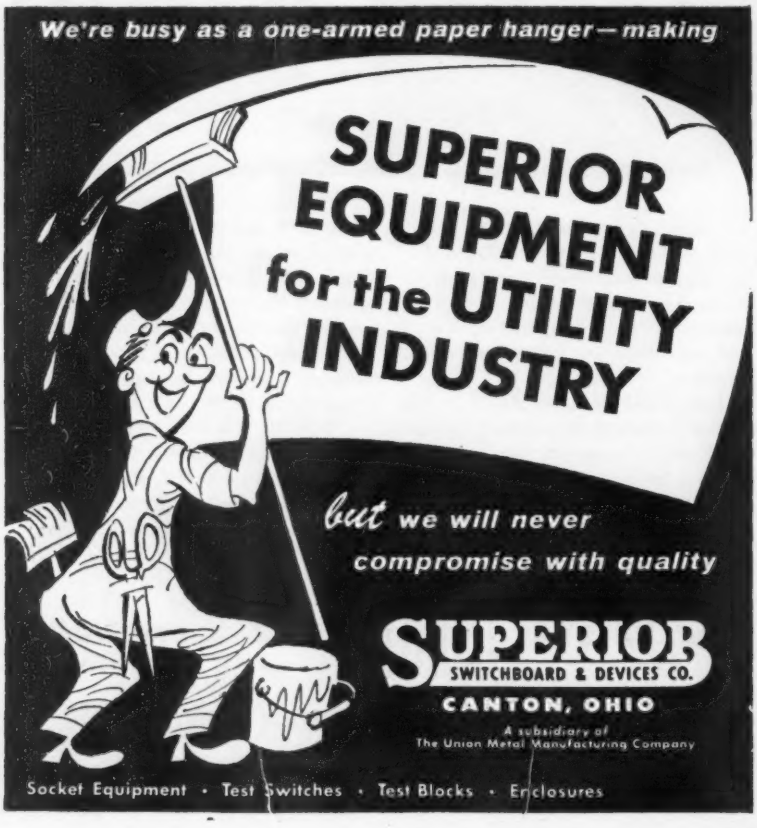
Allan P. Good has been elected to succeed the late **Irving E. Fasan** as assistant controller of Northern Indiana Public Service Co.

El Paso Electric Co has made two promotions: **Thomas W. Arnold** to distribution engineer in the El Paso engineering department, and **Russel D. Gray** to distribution engineer assigned to the Las Cruces engineering department.

Warren A. Logelin has been named vice president in charge of public relations and advertising at Fairbanks, Morse & Co, succeeding **Blair Bolles** who was promoted to vice president—assistant to the president.

Erratum

M. F. Bunnell has been named vice president in charge of industrial relations of Florida Power Corp, not vp-public relations, as reported in *Electrical World,* Oct. 3, page 84. **R. G. MacDonald,** new president of Potomac Edison Co, had been vice president-marketing of West Penn Power Co since 1955, not 1925, as reported in EW, Sept. 12, page 102.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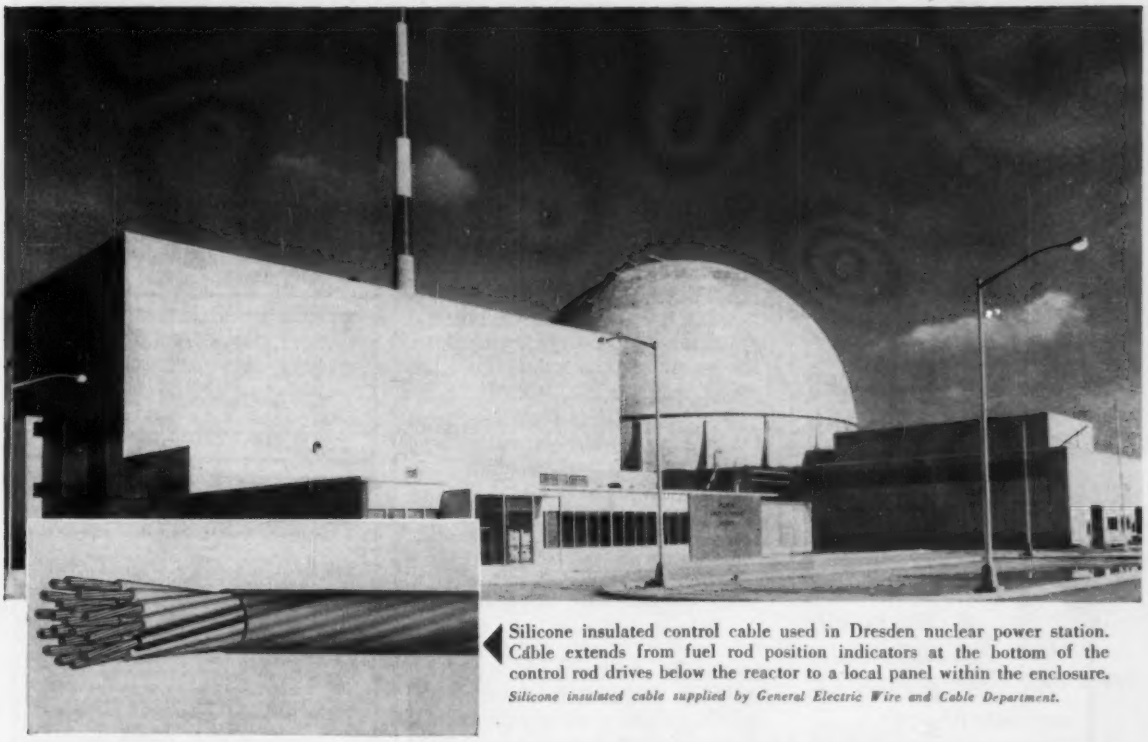

Silicone insulated control cable used in Dresden nuclear power station. Cable extends from fuel rod position indicators at the bottom of the control rod drives below the reactor to a local panel within the enclosure.

Silicone insulated cable supplied by General Electric Wire and Cable Department.

Because it combines many desirable properties, particularly a combination of heat and radiation resistance, General Electric silicone rubber insulation is being specified for control and power cable in atomic reactors and other nuclear power generation equipment.

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Section FF1013, Silicone Products Department
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For details, ask our distributor or write direct!

INDIANA STEEL & WIRE COMPANY, INC.
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Challenge of the 60's

(*Continued from page 57*)

Here are some forces that will be working toward decreased federal activity in this field, he added:

1. As long as the cold war continues to grow in intensity, there will be the need for concentrating federal activity and spending on programs directly involved with defense.

2. The important dramatic issues of the day, that promise to stay in the forefront for at least a decade, including education, health, urban redevelopment, highway construction, economic growth, better housing, and recreation. Federal activity in these fields will cost billions and are much more dramatic and closer to the people's interests than the power question.

3. The growing realization that the entire electric industry is doing a magnificent job in providing America with the world's greatest electric power system.

Call for Earlier Investments

(*Continued from page 61*)

essentially constant. However, it would be necessary for earnings and federal income taxes to increase at a greater rate than the price inflation. The comparison in Table 3 indicates Plan A as the economic choice.

The conclusions can be summarized as follows:

1. Table 2 is erroneous.
2. Table 3 gives an accurate answer if inflationary effects on prices and revenue requirements are accurately forecast.
3. The solution in Table 1 is similar to that in Table 3. It has the advantage of simpler calculations and does not require a forecast of future inflation.

Ground Broken for A-Plant

Ground has been broken for a 17-Mw atomic plant at Parr, S. C., by Carolinas-Virginia Nuclear Power Associates, comprising Virginia Electric & Power Co, Carolina Power & Light Co, Duke Power Co, and South Carolina Electric & Gas Co. The reactor is fired by slightly enriched U-235 and moderated by heavy water.

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Electrical Engineer, Board layout work—power, lighting, and control systems; calculations; and occasional field contacts. Extremely wide variety of work with opportunity to enter consulting field and grow with progressive mid-western concern. P-4617, Electrical World.

Wanted sales engineer to cover Detroit-Chicago and Cleveland areas for manufacturer of truck mounted utility equipment. Must have sales experience in allied lines calling on telephone and electrical power companies. Some engineering experience necessary. Considerable travel. Salary open. Expenses paid. Airmail resume to Paul Cook, District Manager, Truck Equipment Company, 3963 Walnut St., Denver 5, Colorado.

Electrical Engineer, Graduate, with experience in the utility or a related engineering field for a choice of openings in Substation Design, Transmission Line Construction & Design, System Planning, Distribution Planning, and Communications sections. Starting salary—up to $10,000, depending on qualifications. Location—Midwest. Your inquiry will be held in confidence. P-5461, Electrical World.

Service Manager—Hospital equipment manufacturer needs man capable of developing and administering Service program, including training and supervision of men in installation, testing, servicing and repair of hydraulic and electrical equipment. Must be able to develop service literature and manuals. Residence in St. Louis area required. Send complete resume, including salary requirements to P-5463, Electrical World.

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3— 75 kva G.E., 2400/4160Y—120x240

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Of Electrical World, published weekly at Albany, New York for October 1, 1960.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Published by McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York 36, N. Y.; Editor, Charles F. Hochgesang, 330 West 42nd St., New York 36, N. Y.; Managing editor, Herbert Frankel, 330 West 42nd St., New York 36, N. Y.; Business manager, Otto A. Drechsel, 330 West 42nd St., New York 36, N. Y.

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 29,330.

McGRAW-HILL PUBLISHING COMPANY, INC.
By JOHN J. COOKE, Secretary.

Sworn to and subscribed before me this 15th day of September, 1960.
[SEAL] JANET A. HARTWICK.
(My commission expires March 30, 1961)

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steel at 1,100F as soon as ways could be found to install it at prices consistent with thermal gains.

Next to computer control of power plants the most popular topic at the National Power Conference was integrated system planning of generation and transmission facilities. Authors observed that today extensive and complex transmission networks, system interconnections, and pooled operations make integrated planning essential. High-speed analytical tools and better understanding of system performance have made it possible. Today it appears that the savings derived are more than worth the effort required, W. D. Marsh, A. G. Mellor, H. O. Simmons, and B. M. Zombotti of GE pointed out in a paper on planning methods.

In the five-state Rocky Mountain area of Arizona, Colorado, New Mexico, Utah and Wyoming, integrated power system planning activities of privately-financed utilities are expected to save the US government 2,000 miles of transmission and an estimated $100,000,000 if accepted. Detailed plans were presented to the conference in a paper by D. L. Bryner, W. H. Croft, D. E. Martin, R. A. Tynes and R. F. Walker of the five companies. The five-state plan seeks to coordinate utility power developments in the area with hydro installation of the federal government, including the Colorado River Storage Project. Looking to 1980, coal resources in the area provide an almost inexhaustable fuel supply for future generation. But since most of it is remote from load centers, extensive 230 and 345-kv transmission will be required.

Alternative plans for the coordination of future generation and transmission on the system of the General Public Utilities Co in Pennsylvania and New Jersey as outlined by R. W. Wertz suggests three alternative courses:

1. Additional generation in coal field of western Pennslyvania and development of an EHV transmission "turnpike" to supply eastern areas;

2. Additional generation in both western and eastern areas to hold the balance of existing transmission;

3. Modification of plans (1) and (2) to include a prudent balance of peaking capacity among pumped storage hydro, diesel engine sets and peaking steam.

Professional Note Added by Linder, Cisler

US engineering societies today are headed for deep trouble unless they can find new focal points around which to organize and unite the many disciplines that make up the profession, Clarence Linder, president of the American Institute of Electrical Engineers, told a luncheon meeting of the National Power Conference.

Old distinctions between engineers and scientists don't exist any longer. Today we find all grades and types of engineers focusing on a single problem or project. The task that faces the engineering societies is to get the various disciplines together to the end that we can properly organize and manage our modern technology, Linder said.

Observing that AIEE today has half as many organizational components as the federal government, Linder said we can work till doomsday to find umbrellas to cover all the types of engineering interests. What we need to do is to reach out and start to communicate; establish new points of common interest and organize the various engineering disciplines around these points to achieve unity.

Speaking in much the same vein, but at another luncheon, Walker L. Cisler, president of the American Society of Mechanical Engineers, called for intensified efforts to maintain US scientific and engineering supremacy and to keep the profession vigorous and attractive to young men and women.

We have reached a pivotal stage in human progress that is of deep significance to engineers in which man is creating machines after his own likeness with mechanized devices for muscles and automated systems that take over conscious thought and attention. In such a period, Cisler said, the responsibilities of engineers are great.

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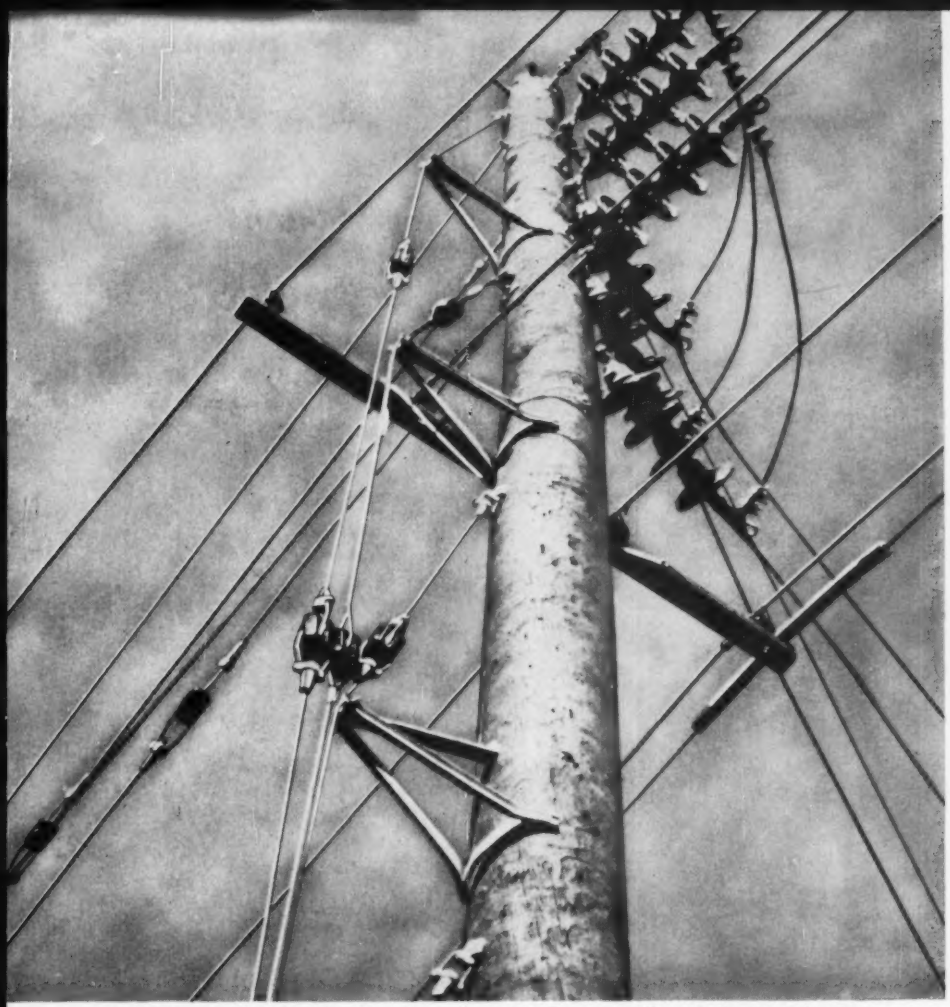

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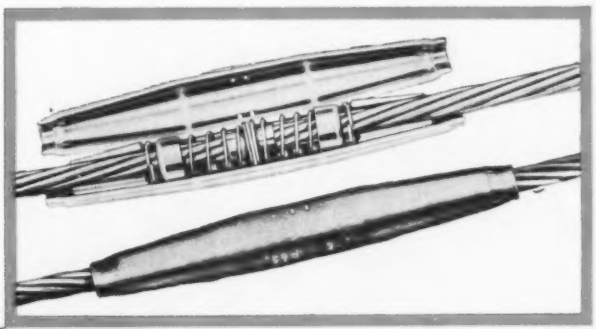

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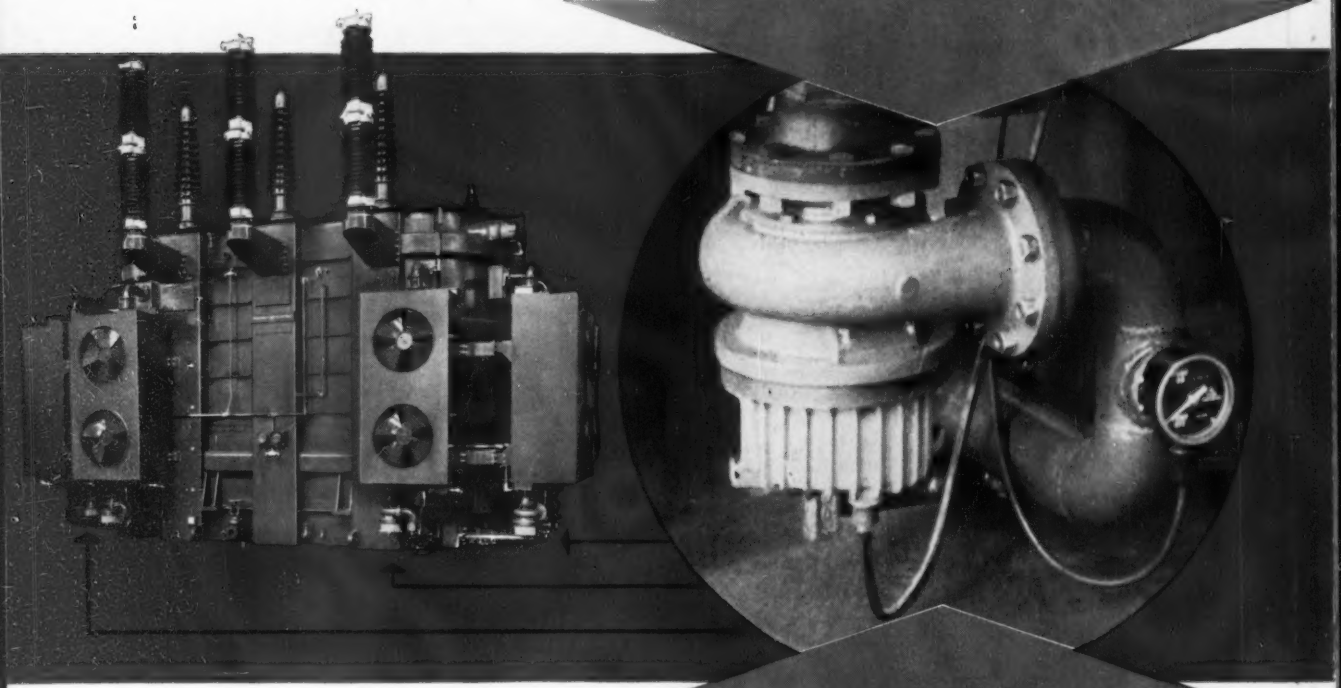

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